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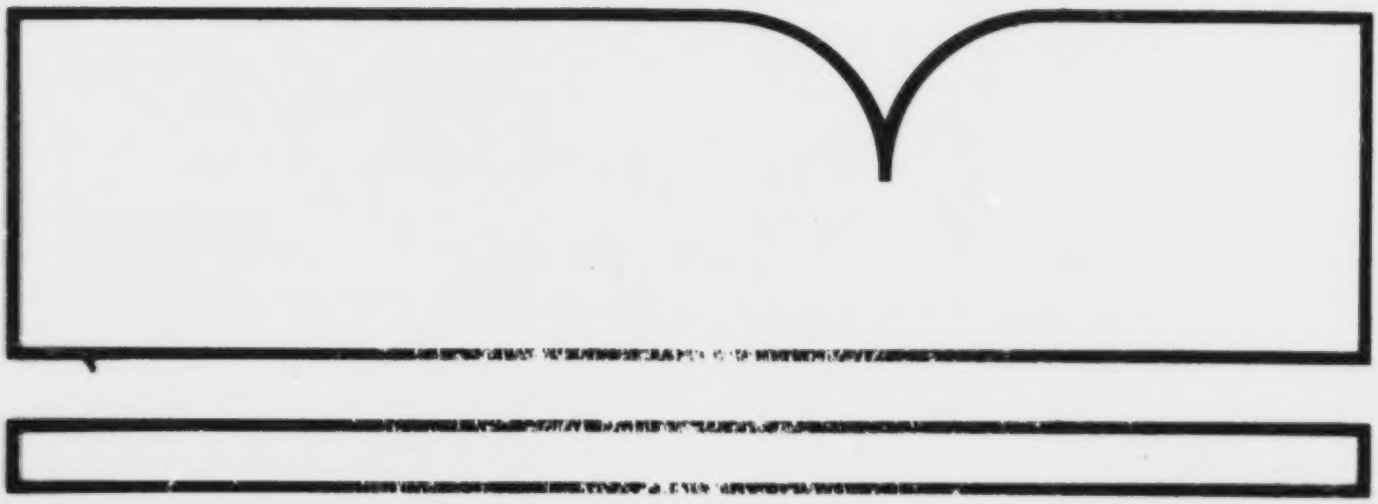
A Study of Emissions from Light Duty Vehicles in San Antonio, Texas

EG and G Automotive Research, Inc.
San Antonio, TX

Prepared for

Environmental Protection Agency, Ann Arbor

Sep 82



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Three hundred 1978 through 1982 in-use light duty vehicles were obtained from the public, in the San Antonio, Metropolitan Area. These vehicles were tested as received, for exhaust emissions utilizing the Federal Test Procedure (FTP), the the Highway Fuel Economy Test (HFET), and four short mode tests. All Vehicles were subjected to a through emissions control component inspection. Fifty vehicles which failed to meet applicable standards, received maintenance and a retest.

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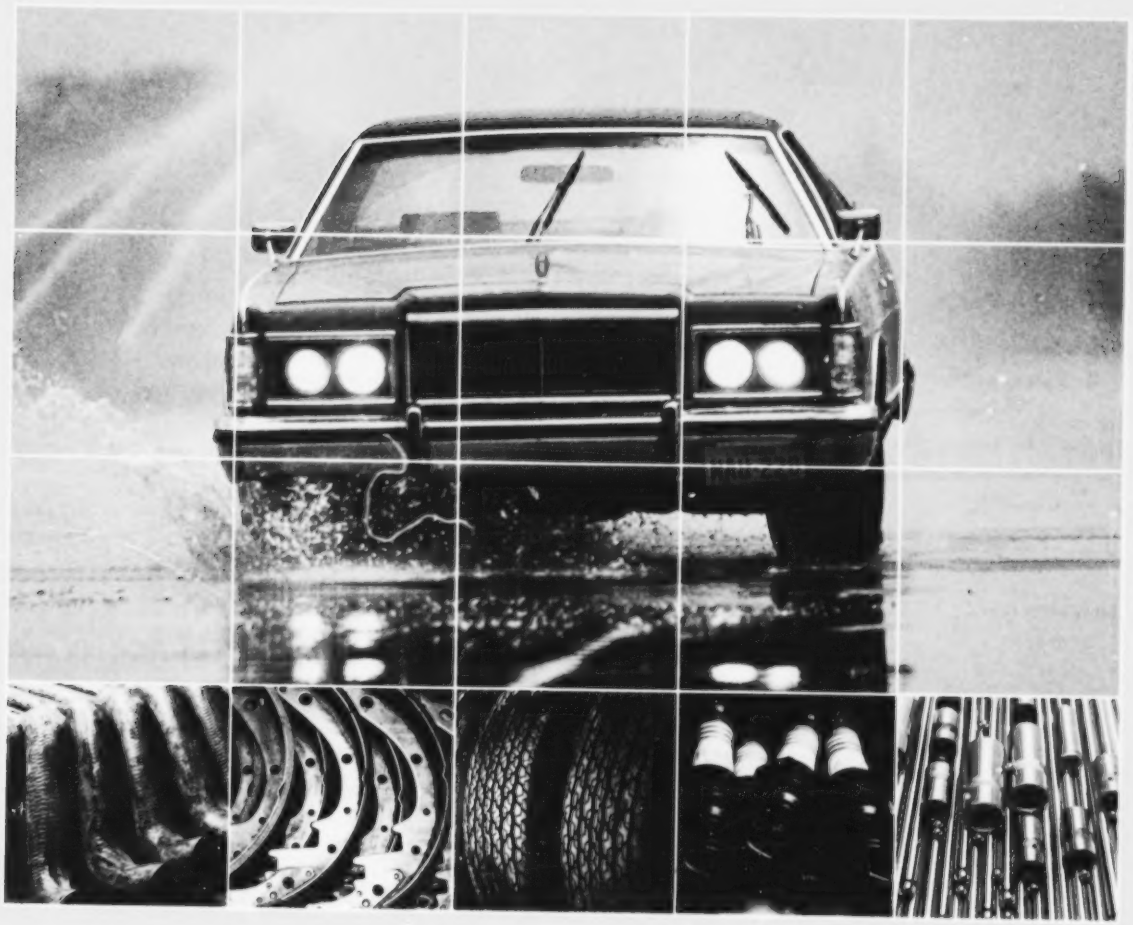

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EPA 460/3-82-009

A Study of Emissions from Light Duty Vehicles in San Antonio, Texas

EPA Contract No. 68-03-3024, Year 2

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DATE: July 30, 1982

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ABSTRACT

Three hundred 1979 through 1982 in-use light duty vehicles were obtained from the public, in the San Antonio metropolitan area. These vehicles were tested, as received, for exhaust emissions utilizing the Federal Test Procedure, the Highway Fuel Economy Test, and four short mode tests. All vehicles were subjected to a thorough emissions control component inspection. Fifty vehicles which failed to meet applicable standards received maintenance and a retest.

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EPA CONTRACT NUMBER 68-03-3024, Year 2

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SECTION I

BACKGROUND

The United States Environmental Protection Agency (EPA) has the authority under the provisions of the Clean Air Act to develop, implement, and administer programs designed to quantify and reduce the pollution of the nations's resources Authority in part for this objective is assigned to EPA's Emission Control Technology Division (ECTD). ECTD is responsible for assessing, quantifying and ultimately reducing air pollution from in-use motor vehicle sources. One of the major test projects that is utilized to attain this goal is the Emissions Factor (EF) Program.

The first EF Program was conducted in EPA's Fiscal Year (FY) 1971. Subsequent Programs were conductd in FY's 1972, 1973, 1974, 1975, 1977, 1979, and 1980. The programs conducted in FY's 1975, 1977 and 1980 were extended to include the following years. These EF Programs were specifically designed to obtain exhaust emissions data from in-use vehicles operated in a wide range of topographical and climatological conditions. During the course of EF Programs, vehicles located in the following U.S. cities have been tested: Chicago, Houston, San Antonio, Denver, Los Angeles, Detroit, Phoenix, St. Louis and Washington, D.C.

The number of model years, number of vehicles to be tested, and any other specific vehicle requirements for each EF Program was established by ECTD. Some of the factors which affected the vehicle requirements were, sales percentages by manufacturer for each model year, changes in emissions standards, advancements in emission control technology and revisions in Federal Testing Procedures.

In the recent EF Programs special short mode testing procedures have been incorporated. These short mode tests are designed to correlate with the more extensive certification tests. These methods are under consideration for use by state governments in vehicle emissions inspection and maintenance programs.

The option year portion of the FY 1980 Emission Factor Study which was conducted in San Antonio, Texas, is the subject of this report. In order to accomplish this study EPA contracted EG&G Automotive Research, Inc. (EG&G-AR) to provide data on vehicles operated in the San Antonio metropolitan area.

SECTION II

INTRODUCTION

In April of 1981, Contract Modification Number 2 to EPA Contract Number 68-03-3024 was issued. This modification added a second group of 300 vehicles for procurement and testing from the San Antonio, Texas metropolitan area. Model years 1979 through 1982 vehicles were required. Vehicles were procured in a random fashion from vehicle registration listings through February of 1982. In accordance with the contract terms, a limited number of 1982 vehicles were obtained through local car rental agencies during the period. A total of 249 vehicles had been procured using these methods. In March 1982, Contract Modification Number 4 was executed. This Modification required that the remaining 51 vehicles be 1980 and 1981 models meeting certain high mileage requirements. Section III, Procurement of Vehicles explains how these vehicles were located and procured.

At the request of EPA, two vehicles from the previous year project (FY 1980 Emissions Factor Study) were re-procured and tested and inspection and maintenance procedures were performed. For the purposes of this report, these two vehicles are included in with the 249 vehicles tested prior to the execution of amendment four. Only light duty, gasoline powered vehicles were included in the program with a contract period from July 1981 through July 1982.

This program is detailed in Section III through Section VII.

- Section III contains a brief narrative of the procurement methods utilized.
- Section IV outlines the methods and procedures used in vehicle preparation, inspection and maintenance.
- Section V describes the emission testing equipment that was used. It also explains calibration procedures. A brief description of the different testing modes is also found in this section.
- Section VI is an explanation of how test results were processed.

- Section VII explains the process that was used in auditing and transmitting test results and equipment calibration data.

SECTION III

PROCUREMENT OF VEHICLES

A. PROCUREMENT METHODS

The EPA supplied a list of three hundred vehicles to be procured and tested. This list is found in Table III-1. Substitutions were made by the EPA for some models that were unavailable. Table III-2 lists these substitutions and the reasons why they were made.

Total vehicle procurement requirements were as follows:

MODEL YEAR	NUMBER OF VEHICLES
1979	25
1980	25
1981	100
1982	99
*1980	34
*1981	17
TOTAL	300

*High mileage vehicles

Each of the model year lists specified the vehicle number, number of units required, make, model, and in some cases, engine size. The Wilson Publishing Company in Houston, Texas was contracted to supply vehicle registration lists for all the required year models. Registration listings were limited by U.S. Postal codes for the immediate San Antonio metroplitan area. All lists were randomized prior to printing by the Wilson Publishing Company.

Procurement mailings were then made from these randomized lists. The mailing consisted of an EPA supplied letter briefly describing the project, a list of normally asked questions and answers and a reply card. Receipt of positive response cards were followed with telephone interviews. Appendix A contains copies of all of the forms and documents that were utilized in the procurement process.

Each of the procurement mailings was recorded in the Sample Vehicle Control Logs. These logs were supplied by EPA and used for tracking each vehicle from initial solicitation to the conclusion of the procurement process. Figure III-1 is a Vehicle Procurement Flow Chart which shows the procurement method that was utilized prior to March 1982. This flow chart reflects the 1982 year model requirements for percentage of high mileages, number of rental vehicles, etc. The same sequence of events applies for all year models.

Amendment Number 4 specified 1980 and 1981 high mileage vehicles. High mileage was defined as 40,000 miles for 1980 vehicles and 25,000 miles for 1981 vehicles. Trucks and General Motors X body vehicles were not required. Other than these exclusions, there were no specific make/model requirements for the high mileage units.

According to the amendment terms, there were no limitations on procurement methods, geographical location or number of rental vehicles. In order to meet the requirements for the high mileage vehicles, procurement methods were modified. These methods included newspaper advertisements,(Appendix A) posting of notices on bulletin board in high traffic areas, making employees and their family and friends aware of the program and contacting individuals and companies that used passenger cars in their business.

ORIGINAL VEHICLE REQUIREMENTS
FY '81 EMISSION FACTORS PROGRAM
SECOND YEAR OPTION
1982 Model Years

Veh. No.	Quantity	Make	Model
401-407	7	CHEV	Chevette
408-412	5	CHEV	Citation
413-417	5	CHEV	Camaro/Malibu
418-423	6	CHEV	Impala/Caprice/Monte Carlo
424-428	5	CHEV	Cavalier
429-434	6	OLDS	Cutlass Supreme
435-439	5	OLDS	88/98/Toronado
440-441	2	OLDS	Omega
442	1	OLDS	Ciera
443-445	3	OLDS	Skylark
446-447	2	BUICK	Le Sabre/Electra
448-452	5	BUICK	Regal/Century
453-454	2	BUICK	Skyhawk J
455-456	2	PONTIAC	6000
457-458	2	PONTIAC	Phoenix
459-460	2	PONTIAC	Bonneville/Grand Prix/Firebird
461-463	3	PONTIAC	J-2000
464-465	2	PONTIAC	T-1000
466-471	6	FORD	Escort
472-474	3	FORD	Fairmont/Thunderbird/LTD
475-478	4	FORD	Mustang/Granada
479-480	2	FORD	EXP
481-483	3	MERCURY	Lynx
484-485	2	MERCURY	LN-7
486	1	MERCURY	Capri/Cougar/Monarch
487-490	4	PLYMOUTH	Reliant
491-493	3	PLYMOUTH	Horizon
494-496	3	DODGE	Omni
497-499	3	DODGE	Aries
500-503	4	VW of A	Rabbit
504-506	3	AMC	Concord
507-509	3	TOYOTA	Corolla
510-512	3	TOYOTA	Tercel
513-514	2	TOYOTA	Celica
515-517	3	DATSUN	210
518-520	3	DATSUN	310
521-522	2	DATSUN	Nissan Stanza

TABLE III-1

1982 Model Year (Cont'd)

Veh. No.	Quantity	Make	Model
523	1	DATSUN	200 SX/280SX/280Z
528-530	3	HONDA	Civic Accord
531-533	3	MAZDA	GLC/626/RX-7
534-535	2	MITSUBUSHI	Colt/Champ/Challenger
536-540	5	CHEV/GMC	L.D. Truck
541-545	5	FORD	L.D. Truck
546-547	2	DODGE	L.D. Truck
548	1	DATSUN	L.D. Truck
549-550	2	TOYOTA	L.D. Truck

ORIGINAL VEHICLE REQUIREMENTS
FY '81 EMISSION FACTORS PROGRAM
SECOND YEAR OPTION

Veh. No.	Quantity	Make	Model
551-557	5	CHEV	Chevette
556-561	6	CHEV	Citation-Three 4-Cyl, Three V-6
562-564	3	CHEV	Malibu-Two V-6, One V-8
562-564	3	CHEV	Camaro
565	1	CHEV	Impala/Caprice
566-567	2	CHEV	Monte Carlo
569-573	5	OLDS	Cutlass/Supreme-Three V-6, Two V-8
574-575	2	OLDS	88/98
576-577	2	OLDS	Omega-One 4-Cyl, One V-6
578-580	3	BUICK	Skylark-Two 4-Cyl, One V-6
581-584	4	BUICK	Century/Regal-Three V-6, One V-8
585	1	BUICK	Le Sabre/Electra
586-587	2	PONTIAC	Phoenix-One 4-Cyl, One V-6
588	1	PONTIAC	Firebird
589-590	2	PONTIAC	Grand Prix
591	1	PONTIAC	Catalina/Bonneville
592	1	PONTIAC	Catalina/Bonneville
593	1	CADILLAC	de Ville/Fleetwood
594-597	4	FORD	Escort
598-600	3	FORD	Fairmont
601-603	3	FORD	Mustang
604	1	FORD	Thunderbird
605-606	2	MERCURY	Lynx
607	1	MERCURY	Zephyr
608	1	MERCURY	Capri
609-610	2	PLYMOUTH	Reliant
611-612	2	PLYMOUTH	Horizon
613-614	2	DODGE	Aries
615-616	2	DODGE	Omni
617-618	2	VW of A	Rabbit
619-620	2	AMC	Concord/Spirit
621-622	2	TOYOTA	Corolla
623-624	2	TOYOTA	Tercel
625	1	TOYOTA	Celica
626-627	2	DATSUN	210
628-629	2	DATSUN	310

1981 Model Year (con'td)

Veh. No.	Quantity	Make	Model
630	1	DATSUN	510
631	1	DATSUN	200SX/280Z
632-633	2	HONDA	Civic
634-635	2	HONDA	Accord
636-637	2	MAZDA	GLC/626/RX-7
638	1	MITSUBISHI	Colt/Arrow/Champ
639	1	SUBARU	Any model except "BRAT"
640	1	VW of A	Dasher
641-643	3	CHEV/GMC	P.U.
644-646	3	FORD	P.U.
647-648	2	DODGE	P.U.
649	1	DATSUN	P.U.
650	1	TOYOTA	P.U.

ORIGINAL VEHICLE REQUIREMENTS
FY '81 EMISSION FACTORS PROGRAM
SECOND YEAR OPTION
1980 Model Year

Veh. No.	Quantity	Make	Model
651-652	2	CHEV	Chevette
653-654	2	CHEV	Citation-One 4-Cyl, One V-6
655	1	CHEV	Malibu
656-657	2	OLDS	Cutlass/Supreme-One V-6, One V-8
658	1	OLDS	88/98
659	1	BUICK	Skylark
660	1	BUICK	Century/Regal
661-662	2	FORD	Mustang
663-664	2	FORD	Fairmont
665-666	2	PLY/DODGE	Horizon/Omni
667	1	VW of A	Rabbit
668	1	AMC	Concord/Spirit
669	1	TOYOTA	Corolla
670	1	TOYOTA	Tercel
671	1	DATSUN	210
672	1	HONDA	Civic
673	1	HONDA	Accord
674	1	CHEV/GMC	P.U.
675	1	FORD	P.U.

ORIGINAL VEHICLE REQUIREMENTS
FY '81 EMISSIONS FACTORS PROGRAM
SECOND YEAR OPTION
1979 Model Year

Veh. No.	Quantity	Make	Model
676	1	CHEV	Chevette
677	1	CHEV	Monza
678	1	CHEV	Malibu
679	1	CHEV	Camaro
680	1	OLDS	Cutlass/Supreme
681	1	OLDS	88/98
682	1	BUICK	Century/Regal
683	1	PONTIAC	Sunbird/Phoenix
684	1	PONTIAC	Firebird/Grand Prix
685	1	FORD	Mustang
686	1	FORD	Fairmont
687	1	FORD	LTD/Thunderbird
688	1	MERCURY	Monarch
689	1	DODGE	Omni
690	1	PLYMOUTH	Horizon
691	1	DATSUN	B210
692	1	DATSUN	510/280Z
693	1	TOYOTA	Corona/Corolla
694	1	TOYOTA	Celica/Cressida
695	1	VW of A	Rabbit
696	1	HONDA	Civic/Accord
697	1	MAZDA	GLC/626 RX7
698	1	CHEV	P.U.
699	1	FORD	P.U.
700	1	DODGE	P.U.

VEHICLES OBTAINED BY ALTERNATE PROCUREMENT METHODS

Veh. No.	Year	Make/Model	Alternate Method	Reason
582	1981	Buick/Century	Rental	EPA Project Officer requested reprocurement of this vehicle.
401	1982	Chev/Chevette	Rental	Per Terms of Contract
474	1982	Ford/Fairmont	Rental	Per Terms of Contract
481	1982	Mercury/Lynx	Rental	Per Terms of Contract
487	1982	Plymouth/Reliant	Rental	Per Terms of Contract
488	1982	Plymouth/Reliant	Rental	Per Terms of Contract
504	1982	AMC/Concord	Rental	Per Terms of Contract
516	1982	Datsun/210	Rental	Per Terms of Contract

TABLE III-2

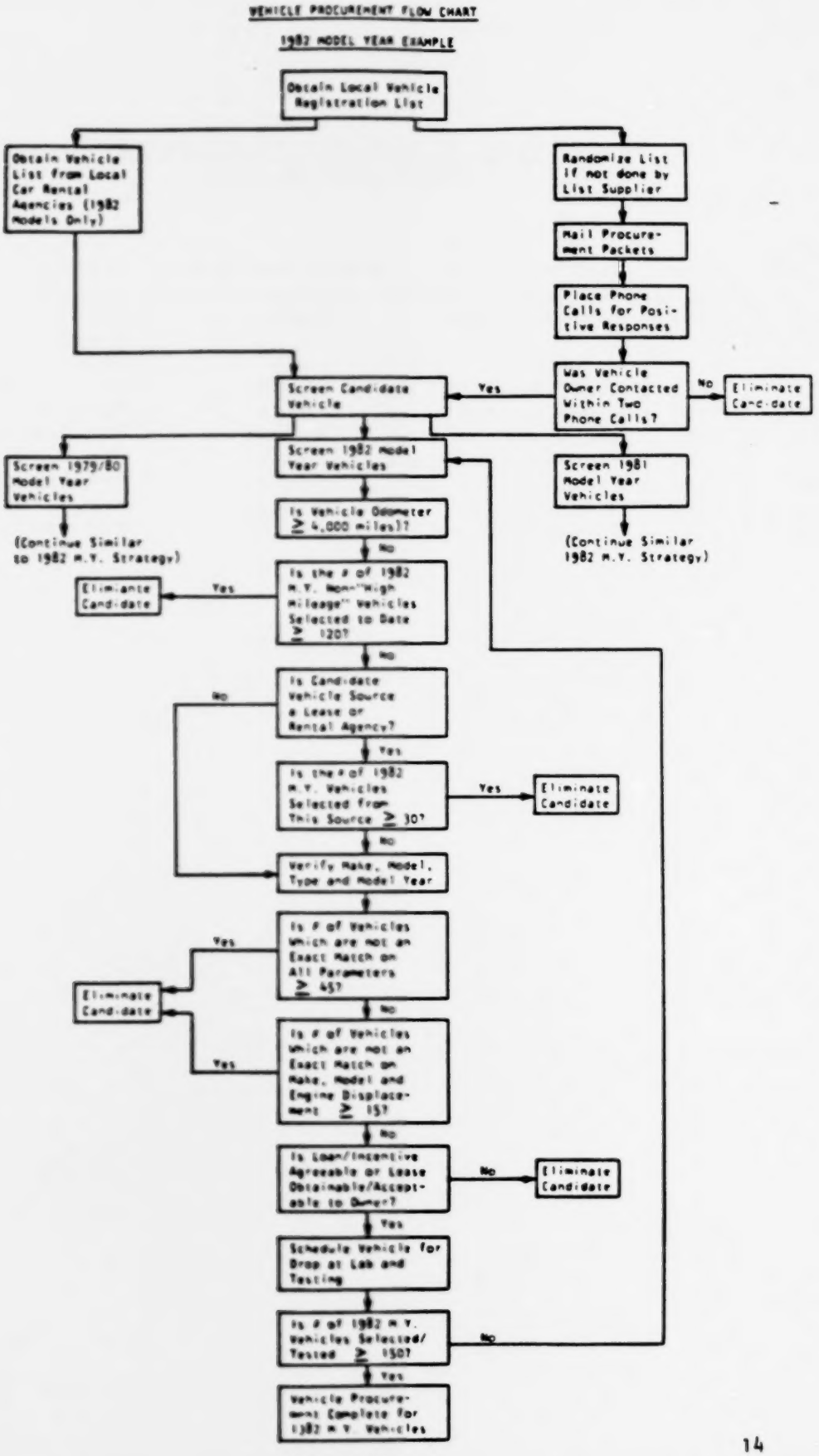

VEHICLE PROCUREMENT FLOW CHART
1982 MODEL YEAR EXAMPLE
Obtain Local Vehicle Registration List
Obtain Vehicle List from Local Car Rental Agencies (1982 Models Only)
Randomize List If not done by List Supplier
Mail Procurement Packets
Place Phone Calls for Positive Responses
Was Vehicle Owner Contacted Within Two Phone Calls?
Yes
No
Eliminate Candidate
Screen Candidate Vehicle
Screen 1979/80 Model Year Vehicles
(Continue Similar to 1982 M.Y. Strategy)
Screen 1982 Model Year Vehicles
Screen 1981 Model Year Vehicles
(Continue Similar 1982 M.Y. Strategy)
Is Vehicle Odometer ≥ 4,000 miles)?
Is the # of 1982 M.Y. Non-"High Mileage" Vehicles Selected to Date ≥ 120?
Eliminate Candidate
Is Candidate Vehicle Source a Lease or Rental Agency?
Is the # of 1982 M.Y. Vehicles Selected from This Source ≥ 30?
Eliminate Candidate
Verify Make, Model, Type and Model Year
Is # of Vehicles Which are not an Exact Match on All Parameters ≥ 45?
Eliminate Candidate
Is # of Vehicles Which are not an Exact Match on Make, Model and Engine Displacement ≥ 15?
Is Loan/Incentive Agreeable or Lease Obtainable/Acceptable to Owner?
Eliminate Candidate
Schedule Vehicle for Drop at Lab and Testing
Is # of 1982 M.Y. Vehicles Selected/Tested ≥ 150?
Vehicle Procurement Complete for 1982 M.Y. Vehicles

Figure III-1

ORIGINAL VEHICLE REQUIREMENTS
VEHICLE SUBSTITUTIONS

ORIGINAL REQUIREMENTS					SUBSTITUTIONS					
Veh. No.	No. of Veh.	Year	Make/Model	Engine	Veh. No.	No. of Veh.	Year	Make/Model	Engine	Reason
582	1	1981	Buick/Century	V 6	582	1	1981	Buick/Century	V 6	EPA Project Officer requested reprocurement of this vehicle.
614	1	1981	Dodge/Aries	Any	614	1	1981	Dodge/Aries	Any	EPA Project Officer requested reprocurement of this vehicle.
617	1	1981	VW of A	Any/ Gasoline	617	1	1981	VW/Pickup	Any	All Registration lists of 1981 VW Rabbits were used. Only positive responses received were from ineligible vehicles (diesel). Substitution approved by Project Officer.
618	1	1981	VW of A	Any/ Gasoline	618	1	1981	VW/Pickup	Any	All registration lists of 1981 VW Rabbits were used. Only positive responses received were from ineligible vehicles (diesel). Substitution approved by Project Officer.
640	1	1981	VW of A/Dasher	Any/ Gasoline	640	1	1981	VW/Van	Any	Registration list supplier and local VW dealers stated that the 1981 Dasher is available with diesel engines only. Substitute was approved by Project Officer.

FIGURE III-2

SECTION IV

VEHICLE, PREPARATION, INSPECTION AND MAINTENANCE

A. INITIAL MECHANICAL INSPECTION

After each vehicle owner was screened by telephone, the owner was asked to deliver the vehicle to the laboratory for testing. On arrival, the vehicle was inspected for exhaust leaks and the Vehicle Information Data Sheet and the Engine Parameter Data Sheet (Appendix B) were completed. During this process all emission control systems and sub-systems were checked to verify that they matched the type listed in the Gas Mileage Guide for that model year. Variances were noted when found.

A fuel sample was taken from the vehicle fuel tank for lead content analysis. The vehicle was then delivered to the Chassis Dynamometer Testing Laboratory for preconditioning and testing.

B. POST TEST INSPECTION

On completion of the "as received" emissions test, each vehicle received a thorough engine and emission control systems inspection. Appendix B of this report contains a copy of the data sheets that were used to record the inspection information. The methods for inspection and the specifications for operating parameters on each system were obtained from Manufacturer's shop manuals or Chilton's Automotive Manuals for the appropriate model. Information from the emissions data sticker, which is found in the engine compartment, was used when available. Observed values, (i.e., basic timing, idle speeds, idle HC and CO levels, etc.) were recorded on the Inspection Data Sheets (Appendix B). The Comments Data Sheet (Appendix B) was used to note any maladjustments, disabled systems or abnormal operating conditions that were found during the inspection.

Representatives from General Motors and the Chyrsler Corporation actively participated in the inspection and

maintenance portions of this project. The EPA Project Officer allowed these representatives to receive copies of emissions test data and observe and/or assist in the inspection and maintenance procedures for their companies respective vehicles. On numerous occasions this participation was beneficial in locating parts, and supplying technical information for emission control systems.

C. RESTORATIVE MAINTENANCE

All three hundred vehicles were tested as received. The test sequence consisted of the FTP emissions test, Highway Fuel Economy Test and a four mode short cycle test. After the test sequence, each vehicle received an extensive inspection of emission-related components and systems.

The first fifty vehicles that failed the exhaust emissions test received a restorative maintenance procedure, followed by an additional test sequence. Pass/Fail criteria for the various model years were established by the EPA as follows:

1. Emission results which were within two times the standard for that model year were considered a pass with the following exception: If during the inspection procedure a problem was found that could account for excessive emissions, a maintenance procedure and retest was recommended. Maintenance procedures and retests were authorized by the EPA in some instances when the results did not exceed the two times limit.

2. In order to simplify the complexity of 1982 standards (due to the various waivers that were granted), the following standards are used as a guideline for all 1982 vehicles:

HC gm/mi	CO gm/mi	*NO_x gm/mi
.41	7.0	1.0

* A 2.0 NO_x gm/mi standard applied to all 1982 American Motors Corporation vehicles.

3. Idle test results greater than 200 PPM, Hexane or 1.2% CO were considered a failure. This was based on the sample taken at the second idle in neutral during the four mode test (immediately after 2,500 RPM in neutral mode).

Once a failure was identified, the inspection-maintenance procedure was initiated. The first step was to review the manufacturer's recommended maintenance intervals. Each item listed for the last interval was inspected and a determination was made as to whether or not the required maintenance had been performed. Any part replacements, adjustments or checks required at the last interval that had not been performed were accomplished during the restorative maintenances.

When the problem was diagnosed as a malfunction in a major component (any single item which would cost in excess of $100.00 to repair or replace) no restorative action was taken as the contract excluded these repairs. The EPA was notified in these cases. Any further action on vehicles in this category was at the EPA's discretion. In all cases the restorative maintenance activities were documented in detail on the Comment Data Sheet in the After Maintenance Data Packet (Appendix B).

Table IV-1 lists each of the restorative maintenances, what problems were found, and the corrective action taken.

RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results		Corrective Actions	After Maint. Test Results		% Δ
				Test Type	Emissions Results (Failed Standards)		Test Type	Emissions Results	
151	1981	7,654	Chev/Chevette	CVS-CH	HC gm/mi .538 CO gm/mi 6.66 NO_x gm/mi .617	Diagnosed as carburetor malfunction. New carburetor assembly supplied and installed by General Motors personnel. Also replaced rubber grommet in valve cover (PVC valve mounting).	CVS-CH	HC gm/mi .235 CO gm/mi 4.18 NO_x gm/mi .584	- 56% - 37% - 5%
				Idle	Hexane ppm 215.5 CO% 1.67		Idle	Hexane ppm 3.18 CO% .009	- 99% - 99.5%
203	1981	6,556	Ford/Mustang	CVS-CH	HC gm/mi 3.76 CO gm/mi 83.4	Found vacuum supply line to the by-pass control switch for the secondary air system disconnected. Timing was also out of specification. Reconnected vacuum line and set timing to manufacturer's specifications.	CVS-CH	HC gm/mi .424 CO gm/mi .891	- 89% - 99%
				Idle	Hexane ppm 406.9 CO% 9.51		Idle	Hexane ppm 4.03 CO% .004	- 99% - 99.9%
154	1981	7,937	Chev/Chevette	CVS-CH	HC gm/mi 1.02 CO gm/mi 10.6	Idle mixture limiting device was removed and idle mixture reset. Decel control valve for secondary air system was broken. Curb idle speed was fast. Replaced decel valve and reset idle mixture and curb idle to manufacturer's specifications. A General Motors representative assisted in this inspection and maintenance procedure.	CVS-CH	HC gm/mi .506 CO gm/mi 6.44	- 50% - 39%
181	1981	17,059	Buick/Regal	CVS-CH	HC gm/mi 1.03 CO gm/mi 20.0	Found electronic mixture control at a fixed duty cycle during idle. The G.M. representative's recommendation was to replace the carburetor. Changed carburetor. New carburetor supplied by G.M.	CVS-CH	HC gm/mi .438 CO gm/mi 8.06	- 57% - 60%
213	1981	2,828	Dodge/Aires	CVS-CH	HC gm/mi .775 CO gm/mi 22.5	Curb and fast idle speeds were high, spark plugs fouled. Replaced spark plugs and reset idle speeds to manufacturer's specifications. The Chrysler representative was consulted on this inspection and maintenance procedure.	CVS-CH	HC gm/mi .648 CO gm/mi 9.12	- 16% - 59%
169	1981	15,925	Olds/Cutlass	CVS-CH	HC gm/mi .581 CO gm/mi 8.54	Found timing advanced 7°, curb idle speed low and air filter element dirty and plugged. Replaced air filter element, reset basic timing and idle speed to manufacturer's specifications. Maintenance procedure was not effective in bringing vehicle to standards. Additional problem was diagnosed as carburetor malfunction. The General Motors representative was consulted on this inspection and maintenance procedure.	CVS-CH	HC gm/mi .591 CO gm/mi 7.55	+ 2% - 12%

TABLE IV-1

RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results: Test Type	As Rec'd Test Results: Emissions Results (Failed Standards)	Corrective Actions	After Maint. Test Results: Test Type	After Maint. Test Results: Emissions Results	Δ
172	1981	14,175	Olds/Cutlass	CVS-CH	NOx gm/mi 3.35	EGR valve was not receiving vacuum signal. Diagnostics indicated emissions control module (ECM) failure. Replacement did not correct problem. Further troubleshooting indicated a faulty coolant temp. sensor. Replaced ECM, (supplied by GM) coolant temp. sensor and air filter element. The General Motors representative was consulted on this inspection and maintenance procedure.	CVS-CH	NOx gm/mi .636	- 81%
299	1979	46,125	Ford/Pickup	CVS-CH	HC gm/mi 4.25 CO gm/mi 49.2	Curb and fast idle speeds low, timing advanced 4°, EGR valve stuck closed, EGR vacuum supply line damaged, idle limiting device had been removed and idle mixture was reset, spark plugs worn and coated with heavy deposits. Leaded fuel was in the tank when received. The tank filler neck had been modified to take leaded fuel. Visual inspection indicated that the catalyst had been recently installed. Replaced spark plugs and EGR vacuum supply line. Cleaned EGR valve and lubricated choke mechanism. Set curb and fast idle speeds, basic timing and idle mixture to manufacturer's specifications.	CVS-CH	HC gm/mi 2.99 CO gm/mi 26.3	- 30% - 47%
				Idle	CO% 1.66		Idle	CO% .163	- 90%
182	1981	9,173	Buick/Century	CVS-CH	HC gm/mi 2.17 CO gm/mi 53.7	Two diagnostic codes were stored in the memory. Troubleshooting indicated an ECM failure. Replaced ECM (supplied by GM). The G.M. representative assisted in this inspection and maintenance procedure.	CVS-CH	HC gm/mi 1.30 CO gm/mi 14.1	- 40% - 74%
				Idle	Hexane ppm 272.0 CO% 7.96		Idle	Hexane ppm 49.9 CO% .657	- 82% - 92%
289	1979	25,182	Dodge/Omni	CVS-CH	HC gm/mi 2.40 CO gm/mi 29.9	Idle limiting device had been modified and idle mixture reset. Fast idle speed was high, timing retarded 4° and the spark plugs were fouled. Replaced spark plugs. Reset idle speed and idle mixture to manufacturer's specifications.	CVS-CH	HC gm/mi 2.12 CO gm/mi 19.9	- 12% - 34%

RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results: Test Type	As Rec'd Test Results: Emissions Results (Failed Standards)	Corrective Actions	After Maint. Test Results: Test Type	After Maint. Test Results: Emissions Results	% Δ
252	1980	32,407	Chev/Chevette	CVS-CH	NOx gm/mi 4.41	EGR vacuum supply line was plugged and idle speeds were incorrect. Vehicle was also overdue for a maintenance interval in accordance with the manufacturer's recommended maintenance schedule. Unplugged EGR vacuum supply line and set idle speeds to manufacturer's specification. Replaced PCV valve, spark plugs and fuel filter.	CVS-CH	NOx gm/mi .933	- 79%
282	1979	41,594	Buick/Regal	CVS-CH	NOx gm/mi 11.0	Curb idle speed was high, basic timing advanced 11° and the EGR valve was inoperative. Replaced EGR valve, reset curb idle speed and basic timing to manufacturer's specifications.	CVS-CH	NOx gm/mi 2.16	- 80%
291	1979	22,516	Datsun/B210	CVS-CH	NOx gm/mi 3.12	Idle limiting device had been removed and idle reset. Curb idle speed high, timing advanced 3°, thermal vacuum switch (TVS) controlling EGR vacuum supply was defective and EGR vacuum supply line was partially plugged. Replaced TVS and EGR vacuum line. Reset curb idle and basic timing to manufacturer's specifications.	CVS-CH	NOx gm/mi 1.59	- 49%
				Idle	Hexane ppm 428.0		Idle	Hexane ppm 85.1	- 80%
					CO% 3.74			CO% .01	- 99.7%
276	1979	45,966	Chev/Chevette	CVS-CH	NOx gm/mi 4.36	Spark plugs fouled and curb idle speed too high. EGR vacuum supply line was plugged and the EGR valve was inoperative. Replaced spark plugs, EGR valve and EGR vacuum supply line. Reset curb to manufacturer's specifications.	CVS-CH	NOx gm/mi 1.40	- 68%
300	1979	31,230	Dodge/Pickup	CVS-CH	HC gm/mi 4.81	Idle limiting device was in place	CVS-CH	HC gm/mi 3.50	- 27%
					CO gm/mi 39.2	but propane check indicated a rich mixture. Spark plugs were worn and the PCV valve vacuum supply line was the wrong size causing a vacuum leak at the valve and the carburetor. Removed idle limiting device and reset idle mixture to manufacturer's specifications. Replaced spark plugs and PCV vacuum supply line.		CO gm/mi 28.3	- 28%

RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results		Corrective Actions	After Maint. Test Results		% Δ
				Test Type	Emissions Results (Failed Standards)		Test Type	Emissions Results	
267	1980	12,409	VW/Pickup	Idle	CO% 2.60	Spark plugs were worn and fouled. Idle mixture set rich (special tool is required to set mixture). Replaced spark plugs and reset idle mixture to manufacturer's specifications.	Idle	CO% .832	- 68%
690	1979	44,750	Plymouth/Horizon	CVS-CH	HC gm/mi 2.75 CO gm/mi 45.61	Idle limiting device was removed and idle mixture had been reset. Screws were loose in carburetor causing fuel	CVS-CH	HC gm/mi 1.55 CO gm/mi 31.6	- 44% - 31%
				Idle	Hexane ppm 253.3 CO% 2.36	leakage. Spark plugs were fouled and not properly torqued. Replaced spark plugs. Tightened carburetor screws and reset idle mixture to manufacturer's specifications.	Idle	Hexane ppm 11.3 CO% .006	- 96% - 99.8%
674	1980	29,133	Chev/Pickup	CVS-CH	HC gm/mi 3.96 CO gm/mi 71.0 NOx gm/mi 4.11	Idle limiting device had been removed and idle mixture reset. Spark plugs were fouled, air filter dirty and the EGR valve was inoperative.	CVS-CH	HC gm/mi 2.85 CO gm/mi 49.8 NOx gm/mi 1.41	- 28% - 30% - 66%
				Idle	Hexane ppm 321.7 CO% 2.45	Replaced spark plugs, air filter and EGR valve. Reset idle mixture to manufacturer's specifications.	Idle	Hexane ppm 20.4 CO% .007	- 94% - 99.7%
617	1981	6,145	VW/Pickup	CVS-CH	NOx gm/mi 3.28	EGR vacuum supply line was damaged and leaking. Replaced EGR vacuum supply line.	CVS-CH	NOx gm/mi 2.45	- 25%
661	1980	26,649	Ford/Mustang	CVS-CH	HC gm/mi 1.70 CO gm/mi 29.0	Idle limiting device had been removed and idle mixture reset. Spark plugs were fouled, one spark plugs wire was	CVS-CH	HC gm/mi .470 CO gm/mi 11.8	- 72% - 59%
				Idle	Hexane ppm 256.8 CO% 7.42	in poor condition and the air and fuel filters were dirty. Replaced spark plugs, one plug wire, air filter and fuel filter. Reset idle mixture to manufacturer's specifications.	Idle	Hexane ppm 19.2 CO% .004	- 93% - 99.9%
536	1982	9,732	Chev/Pickup	Idle	Hexane ppm 296.5	Spark plugs were fouled and air filter was dirty. Replaced spark plugs and air filter.	Idle	Hexane ppm 108.3	- 63%
685	1979	37,671	Ford/Mustang	CVS-CH	HC gm/mi 3.15	Idle limiting device had been removed and idle mixture reset. Spark plugs fouled. Replaced spark plugs. Reset idle mixture to manufacturer's specifications.	CVS-CH	HC gm/mi 1.28	- 59%

RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results: Test Type	As Rec'd Test Results: Emissions Results (Failed Standards)	Corrective Actions	After Maint. Test Results: Test Type	After Maint. Test Results: Emissions Results	% Δ
640	1981	6,766	VW/Vanagon	Idle	CO% 1.85	Idle limiter device was in place but idle mixture was rich. Reset idle mixture to manufacturer's specifications.	Idle	CO% 1.04	- 44%
659	1980	33,466	Buick/Skylark	CVS-CH	NOx gm/mi 6.01	Spark plugs worn and air filter dirty. EGR vacuum supply line was plugged. Replaced spark plugs, air filter and EGR vacuum supply line.	CVS-CH	NOx gm/mi 1.32	- 78%
408	1981	25,439	Chev/Monte Carlo	CVS-CH	HC gm/mi 24.9 CO gm/mi 134.6	Spark plugs worn, air filter dirty, oxygen sensor inoperative, front choke unloader was not working and the curb idle speed was high. Replaced spark plugs, air filter, oxygen sensor and front choke unloader.	CVS-CH	HC gm/mi 1.15 CO gm/mi 19.3	- 95% - 86%
443	1980	40,440	Ford/Fairmont	CVS-CH	HC gm/mi 2.93 CO gm/mi 47.3	Idle limiting device has been removed and idle mixture was reset. Spark plugs were fouled and air filter was	CVS-CH	HC gm/mi 1.07 CO gm/mi 15.8	- 63% - 67%
				Idle	Hexane ppm 507.5 CO% 8.63	dirty. Replaced spark plugs and air filter. Reset idle mixture to manufacturer's specifications.	Idle	Hexane ppm 28.1 CO% .235	- 95% - 97%
444	1980	45,730	Pontiac/Sunbird	CVS-CH	HC gm/mi 1.04	Spark plugs fouled and curb idle speed high.	CVS-CH	HC gm/mi .986	- 5%
				Idle	Hexane ppm 227.0	Replaced spark plugs and reset idle speed to manufacturer's specifications.	Idle	Hexane ppm 155.8	- 31%
457	1980	41,322	Plymouth/Horizon	CVS-CH	HC gm/mi .774 CO gm/mi 10.4	Spark plugs were worn and the air filter was dirty. Curb idle speed was high. Replaced spark plugs and air filter. Reset curb idle speed to manufacturer's specifications. The maintenance procedure was not effective in reducing emissions. Consulted the Chrysler representative. He suggested additional checks including a check of the air switching system and the carburetor nozzle drip rate. No additional problems could be located and a third test was conducted. The results still showed no improvement.	CVS-CH	HC gm/mi .994 CO gm/mi 12.3	+ 22% + 18%

RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results: Test Type	As Rec'd Test Results: Emissions Results (Failed Standards)	Corrective Actions	After Maint. Test Results: Test Type	After Maint. Test Results: Emissions Results	% Δ
457 (continued)						Problem was diagnosed as malfunctioning catalyst and/or carburetor problem in the off idle circuit.			
411	1980	27,436	Plymouth/Horizon	CVS-CH	HC gm/mi 1.33 CO gm/mi 8.23	Curb idle speed was high. Spark plugs were worn and incorrect part number for this engine. The air filter was dirty. Replaced spark plugs and air filter. Reset curb idle speed to manufacturer's specifications.	CVS-CH	HC gm/mi .635 5.47	- 52% - 34%
416	1981	42,995	Mercury/Lynx	CVS-CH	NOx gm/mi 1.57	Basic timing was advanced 5°, curb idle speed high, spark plugs worn, air filter dirty and the EGR vacuum supply line was disconnected. Replaced spark plugs and air filter; connected EGR vacuum supply line. Reset basic timing and curb idle speed to manufacturer's specifications.	CVS-CH	NOx gm/mi .477	- 70%
455	1980	70,397	Plymouth/Horizon	CVS-CH Idle	HC gm/mi 13.9 CO gm/mi 16.8 NOx gm/mi 2.40 Hexane ppm 344.5	Air filter dirty, one spark plug wire was melted, another spark plug wire was disconnected, curb idle speed was low and the idle mixture was set rich although the limiting device was in place. Replaced air filter and one spark plug wire. Connected spark plug wire and reset curb idle speed and idle mixture to manufacturer's specifications.	CVS-CH Idle	HC gm/mi .841 CO gm/mi 9.85 NOx gm/mi 1.53 Hexane ppm 11.2	- 94% - 41% - 36% - 97%
415	1981	50,334	Subaru/GL	CVS-CH Idle	HC gm/mi 2.63 CO gm/mi 71.2 CO% 2.23	Plug connector to the duty cycle control solenoid valves was disconnected and the alternator belt was loose. Reconnected duty cycle control solenoid valves and tightened alternator belt.	CVS-CH Idle	HC gm/mi .191 CO gm/mi 3.11 CO% .009	- 93% - 96% - 99.6%
456	1980	40,650	Datsun/210	Idle	Hexane ppm 235.5 CO% 1.42	Idle mixture limiting device had been removed and idle mixture was reset. The air cleaner was dirty and wrong part number spark plugs were in the engine. Replaced air cleaner and spark plugs. Reset idle mixture to manufacturer's specifications.	Idle	Hexane ppm 31.1 CO .008	- 87% - 99.4%

RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results		Corrective Actions	After Maint. Test Results		% Δ
				Test Type	Emissions Results (Failed Standards)		Test Type	Emissions Results	
446	1980	76,563	Datsun/B-210	Idle	Hexane ppm 259.3 CO% 1.21	Idle mixture limiting device had been removed and idle mixture reset. Spark plugs were worn, air filter dirty and curb idle speed was fast. Replaced spark plugs and air filter. Reset curb idle speed and idle mixture to manufacturer's specifications. Although the maintenance resulted in emissions reduction, the vehicle still did not pass the idle HC standards. The problem was diagnosed as malfunctioning carburetor.	Idle	Hexane ppm 218.6 CO% .389	- 16% - 68%
445	1980	53,579	Ford/Pinto	CVS-CH	NOx gm/mi 3.35	Idle limiting device had been removed and idle mixture reset. Spark plugs were worn, air filter was dirty and the EGR valve was not working. Further inspection showed that the carburetor spacer plate EGR ports were completely plugged with carbon deposits. Replaced spark plugs, air filter and EGR spacer plate. Reset idle mixture to manufacturer's specifications.	CVS-CH	NOx gm/mi 1.27	- 62%
458	1980	59,888	Mercury/Monarch	CVS-CH Idle	HC gm/mi 3.23 CO gm/mi 88.9 Hexane ppm 325.7 CO% 10.5	Idle limiting device was missing. Further diagnosis indicated a malfunctioning carburetor. Spark plugs worn and air filter dirty. Replaced carburetor, spark plugs, and air cleaner. Set idle mixture and idle speed to manufacturer's specifications.	CVS-CH Idle	HC gm/mi .348 CO gm/mi 2.54 Hexane ppm 5.97 CO% .007	- 89% - 97% - 98% - 99.9%
493	1980	73,586	Chev/Malibu	CVS-CH	HC gm/mi .75%	Spark plugs, distributor cap and rotor were worn. Timing was advanced 4° and idle speed was fast. Replaced spark plugs, distributor cap and rotor. Reset timing and idle speeds to manufacturer's specifications. Although the maintenance procedure was effective in reducing HC emissions, the vehicle still did not meet the standard. Compression and leakdown checks were performed. Results indicated excessive piston ring wear on four cylinders and valve guide wear on three cylinders.	CVS-CH	HC gm/mi .646	- 14%

RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results: Test Type	As Rec'd Test Results: Emissions Results (Failed Standards)	Corrective Actions	After Maint. Test Results: Test Type	After Maint. Test Results: Emissions Results	% Δ
495	1980	49,038	Ford/Mustang	CVS-CH	HC gm/mi .809 CO gm/mi 11.952	Idle mixture limiting device had been removed and idle mixture reset. Spark plugs were fouled, air filter dirty and the distributor cap and rotor were worn. Curb idle speed was fast. Replaced spark plugs, air filter and the distributor cap and rotor. Reset idle mixture and curb idle speed to manufacturer's specifications. Although the maintenance procedure was effective in reducing emissions, the vehicle still did not pass the standards. A wet and dry cylinder compression check was performed. The results indicated excessive ring and valve guide wear on two cylinders.	CVS-CH	HC gm/mi .718 CO gm/mi 7.192	- 11% - 40%
643	1981	22,993	Chev/Pickup	CVS-CH	NO_x gm/mi 3.88	EGR vacuum supply line was disconnected and plugged. Spark plugs fouled and air filter dirty. Replaced EGR vacuum supply line, spark plugs, and air filter. Although the maintenance procedure was effective in reducing NO_x emissions, HC and CO increased substantially. Further diagnosis indicated a major carburetor malfunction. Carburetor replacement would have exceeded the contractural limits. No further action was taken.	CVS-CH	NO_x gm/mi .979	- 75%
662	1980	28,315	Ford/Mustang	CVS-CH	HC gm/mi 2.17 CO gm/mi 38.2	Idle limiting device had been removed and the idle mixture was reset. Spark plugs were worn and fouled.	CVS-CH	HC gm/mi .515 CO gm/mi 6.24	- 76% - 84%
				Idle	Hexane ppm 381.8 CO% 5.55	Replaced spark plugs. Reset idle mixture to manufacturer's specifications.	Idle	Hexane ppm 3.78 CO% .004	- 99% - 99.9%
587	1981	15,564	Pontiac/Phoenix	CVS-CH	HC gm/mi 1.10 CO gm/mi 9.01	Preliminary diagnosis indicated a mixture control solenoid malfunction and fouled spark plugs. A new carburetor assembly was supplied by G.M. When the old carburetor assembly was removed, it was discovered that the ceramic grid portion of the Early Fuel Evaporation (EFE) system had been damaged by an electrical short. Replaced spark plugs, EFE grid and gasket and carburetor assembly.	CVS-CH	HC gm/mi .308 CO gm/mi 3.76	- 72% - 58%

RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results			Corrective Actions	After Maint. Test Results			Δ
				Test Type	Emissions Results (Failed Standards)			Test Type	Emissions Results		
663	1980	27,150	Ford/Granada	CVS-CH	CO gm/mi	34.0	Idle limiting device had been removed and the idle mixture was reset. Hot air duct from the manifold to air cleaner assembly was missing. Spark plugs were fouled and the air filter was dirty. Replaced hot air duct, spark plugs, air filter, and fuel filter. The fuel filter was a manufacturer's recommended maintenance interval item.	CVS-CH	CO gm/mi	6.23	- 82%
				Idle	Hexane ppm	483.2		Idle	Hexane ppm	2.70	- 99.5%
					CO%	5.24			CO%	.007	- 99.9%
548	1982	1,989	Datsun/Pickup	CVS-CH	HC gm/mi	1.85	Idle mixture device had been removed and the idle mixture was reset. Reset idle mixture to manufacturer's specifications.	CVS-CH	HC gm/mi	.936	- 49%
					CO gm/mi	20.5			CO gm/mi	9.14	- 55%
				Idle	Hexane ppm	393.0		Idle	Hexane ppm	24.0	- 94%
					CO%	6.20			CO%	.012	- 99.8%
465	1980	74,245	Ford/Fairmont	CVS-CH	HC gm/mi	1.13	Idle limiting device had been removed and the idle mixture reset. A vacuum line was loose from the carburetor and the EGR vacuum supply line was plugged. Spark plugs were worn and the air filter was dirty. Replaced spark plugs and air filter. Reconnected loose vacuum line and unplugged EGR vacuum supply line. Reset idle mixture to manufacturer's specifications.	CVS-CH	HC gm/mi	.767	- 32%
					CO gm/mi	13.1			CO gm/mi	7.53	- 43%
					NOx gm/mi	2.30			NOx gm/mi	.879	- 62%
499	1980	40,371	Pontiac/Bonneville	CVS-CH	HC gm/mi	1.40	Idle limiting device had been removed and the idle mixture was reset. Spark plugs were worn and the air filter was dirty. The EGR valve and the rear vacuum choke break were not functioning. Replaced spark plugs, air filter EGR valve and rear vacuum choke break. Reset idle mixture to manufacturer's specifications.	CVS-CH	HC gm/mi	1.04	- 26%
					CO gm/mi	21.7			CO gm/mi	14.2	- 35%
					NOx gm/mi	4.70			NOx gm/mi	1.95	- 59%
501	1980	45,851	Ford/Pinto	CVS-CH	NOx gm/mi	4.77	Idle limiting device had been removed and the idle mixture was reset. Spark plugs were worn and the air filter was dirty. The EGR valve was not functioning. After further investigation of the EGR system, the problem was identified as plugged passages in the EGR spacer plate.	CVS-CH	NOx gm/mi	1.68	- 65%

RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results: Test Type	As Rec'd Test Results: Emissions Results (Failed Standards)	Corrective Actions	After Maint. Test Results: Test Type	After Maint. Test Results: Emissions Results	% Δ
501 (continued)						Replaced spark plugs and air filter. Cleaned carbon deposits from the EGR passages in the spacer plate. Reset idle mixture to manufacturer's specifications.			
505	1980	39,104	Olds/Cutlass	CVS-CH	NOx gm/mi 5.39	Spark plugs were worn and the air filter was dirty. The EGR valve was malfunctioning and the carburetor vent line to the evaporative emission cannister was disconnected. Replaced spark plugs, air filter and EGR valve. Reconnected cannister vent line.	CVS-CH	NOx gm/mi 1.34	- 75%
506	1980	59,339	Chev/Caprice	CVS-CH	HC gm/mi .970 CO gm/mi 8.19	Spark plugs were worn and the air filter was dirty. Idle speeds were fast. Replaced spark plugs and air filter. Reset idle speeds to manufacturer's specifications.	CVS-CH	HC gm/mi .644 CO gm/mi 7.71	- 32% - 6%
503	1980	40,671	Olds/Cutlass	CVS-CH	HC gm/mi 1.34 CO gm/mi 10.8	Spark plugs were worn and the air filter was dirty. Replaced spark plugs and air filter. The maintenance procedure was not effective in reducing vehicle emissions. Further diagnosis indicated a malfunctioning carburetor and/or catalyst. Replacement of these items would have exceeded contractural limits.	CVS-CH	HC gm/mi 1.72 CO gm/mi 10.1	+ 28% - 6%
519	1980	45,121	Chev/Chevette	CVS-CH	CO gm/mi 9.32 NOx gm/mi 5.46	Spark plugs were worn, air filter was dirty and the EGR valve was not functioning. Replaced spark plugs, air filter and EGR valve.	CVS-CH	CO gm/mi 8.72 NOx gm/mi 2.47	- 6% - 55%

SECTION V

VEHICLE EMISSION TESTING

A. TEST LABORATORY

EG&G-AR Chassis Dynamometer Testing Laboratory is located at 5404 Bandera Road, San Antonio, Texas. A floor plan of this lab is included as Figure V-1. This lab presently consists of two automotive test cells and chassis dynamometers, one motorcycle chassis dynamometer test cell, emissions analytical equipment, soak area and support equipment. Details on most equipment are available in Appendix C, EPA Laboratory Qualification Worksheets.

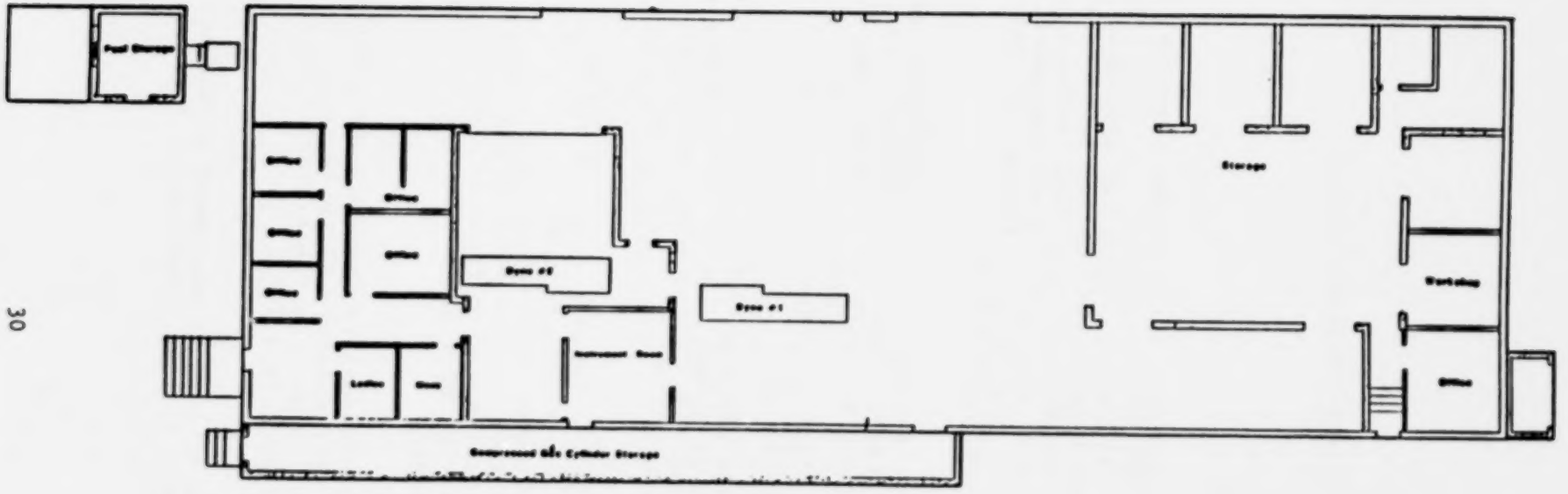
Test Cell Number One was used for the data generated in the Emission Factor Program. This cell contains a Clayton ECE-50 chassis dynamometer with an inertia range of 1000 lbs. to 8875 lbs. in 125 lb. increments. The drivers aid is a Hewlett-Packard 7133A recorder. A Hartzell N24D WW fan was used in this cell.

A CFV-CVS System was utilized for testing under this contract. The system is a Horiba Model 20-B-CFV-CVS with a flow capacity of 325 CFM. Details may be found in Appendix D.

The Emission Analytical Console used was constructed by Horiba Instruments according to EG&G-AR specifications. The console contains a total of seven analyzers on two sample trains for both dilute and raw exhaust gas analysis. Details on this console may be found in Appendix D. Additionally, a Horiba Mexa 321 E was used for undiluted HC (Hexane) measurements.

EG&G-AR's Chassis Dynamometer Testing Laboratory has a soak area capacity of approximately 12 to 14 vehicles, dependent upon vehicle size. Soak area temperature is controlled year-round to a target 74 ± 3 F.

A full complement of support equipment is located in the Chassis Dynamometer Testing Laboratory. This equipment is



EG&G AUTOMOTIVE RESEARCH, INC.,
CHASSIS DYNAMOMETER TESTING LABORATORY

FIGURE V-1

detailed in Appendix D but essentially consists of temperature and humidity recorders, a barometer, clocks, timers, calibration equipment, lead (Pb) test kit and a zero gas generator.

B. TEST PROCEDURES

1. Precondition Procedures

On all vehicles the "as received" fuel was drained and refilled to tank-fuel volumes (40% of tank capacity) with the appropriate test fuel. The vehicles were run on the dynamometer for the first 505 seconds of the Federal Cycle. During preconditioning and the cold transient phase of the FTP, a vehicle driveability evaluation form was completed. The preconditioning ensured that the test fuel had purged the vehicle's fuel system and the engine had achieved a normal operating termperature. Test vehicles were then placed in the soak area. The required ambient temperature in the soak area was maintained and the prescribed 12 to 36 hour soak began. The ignition was not turned on again until the beginning of the emissions test.

2. FTP Procedure

The basic test performed on each vehicle was the Federal Test Procedure for exhaust emissions as described in Federal Register Vol. 42, No. 125 - Tuesday, June 28, 1977 and as amended in Vol. 43, No. 220 - Tuesday, November 14, 1978. This procedure was modified and expanded by EPA guidelines contained in the subject contract.

3. Highway Fuel Economy Test Procedures and Requirements

After the FTP, the vehicle was operated on the chassis dynamometer at 50 miles per hour for a period of three minutes. The "50 cruise" short cycle test was performed at this time. Within one minute of completion of this cruise period, the vehicle commenced operation over the 10.242 mile, 765 second driving schedule. The CVS system was used to gather the dilute exhaust for the purpose of emission and fuel economy

calculations. The engine was at an idle condition at the beginning of the sampling period. The tolerance of this driving schedule was identical to those defined in the basic FTP driving schedule.

Dynamometer loading and transmission shift points follow the procedures required for FTP tests.

4. Additional Test Cycles

This set of four short cycle tests included; 50 cruise, four-speed idle test, two-mode loaded test and bagged idle test. Measurements of diluted and undiluted HC, CO, CO_2 and NO_x emissions were accomplished with instruments described in Section V - A. Test Laboratory. The entire sequence was conducted with the hood open and the auxiliary cooling fan on. For the final test (two speed idle test), the inertia was reduced to the lowest available setting (1,000 lbs.). Each of the short cycle tests began after a six (± one) minute idle period with the transmission in neutral. The idle period began immediately after the end of the preceding test. If the time between tests was exceeded by less than two hours, the vehicle was preconditioned by driving thefirst 505 seconds of the FTP Driving Schedule. The test sequence then resumed, beginning with a six minute idle. If the idle time was exceeded by more than two hours, the vehicle was placed in soak from 12-36 hours and retested from the beginning of the cold start FTP. In each case, equilibrium of engine (or vehicle) speed and analyzer outputs were achieved before the readings are taken. Only in the case of the 50 Cruise Test, did the mode exceed 30 seconds after the proper engine (or vehicle) speed and dynamometer load had been reached. Emission values were monitored continuously on strip chart recorders. Sample data sheets are located in Appendix C. Details of the procedures for each of the short cycles are listed below.

a. The 50 Cruise Test was a high speed loaded test that takes advantage of the three minute preconditioning run before the HFET. Tailpipe emission concentrations were measured and recorded continuously throughout the period although the official sampling period ended 30 seconds after speed and load had stabilized at 50 mph.

b. The Four-Speed Idle Test involved four steady state idle conditions with the transmission in neutral. Emissions concentrations were measured and recorded at basic idle, idle at 2500 RPM and after returning to basic idle. The transmission was then placed in drive (with brakes applied) for sampling in the fourth mode.

c. The Two-Mode Loaded Test consisted of two operating conditions. At the end of the six minute idle period, the vehicle was operated at 30 mph while setting 9.0 actual horsepower and 1,000 lbs inertia weight. Immediately following sampling in this mode, the vehicle was returned to the idle mode, the transmission placed in neutral and the emissions sampled again.

d. The Bagged Idle Test followed the FTP and preceded the HFET. The Bagged Idle Test required the use of the same instrumentation as the FTP to measure dilute exhaust emissions during one steady state of operation.

The test was preceded by an "engine-off" soak period of six (± one) minutes. At the end of this soak period, the vehicle was restarted and operated for three minutes at idle with the transmission in drive (manual transmission vehicles were operated in neutral with the clutch engaged). The three minute sampling period began at the time the starter was engaged so that the engine cranking was included as part of the sample. During the three minute period, the exhaust sample was gathered through the CVS.

C. CALIBRATIONS

The following calibrations were performed routinely during the contract period. No changes in usual lab operations were required to meet the requirments of the subject contract.

1. Chassis Dynamometer

The chassis dynamometer received the following calibrations: A complete calibration was performed prior to initiation of testing. The calibration included speed, load cell deadweight, deadband adjustment and dynamometer coastdowns. This calibration was repeated after maintenance was performed that could affect the calibration or whenever a weekly verification exceeded the ± 0.5 road load horsepower tolerance.

On a weekly basis coastdown times were verified on half of the inertia weight and road load combinations used. The following week the remainder of the inertia weight and road load combinations used were verified. A speed check at 74.54 km/hr (46.3 mph), 1800 RPM was performed on a weekly basis.

During the dynamometer warm-up and prior to the start of each test, the indicated horsepower for the selected inertia weight was verified at 50 MPH. The dynamometers were lubricated and maintained in accordance with Clayton's recommended maintenance schedule.

2. CVS System

The CFV-CVS System received a complete calibration, according to the guidelines set forth in Title 40, Code of Federal Regulations, Part 86, Section 86.199-78 (b) CFV calibration, prior to the start of the program, when maintenance was performed that could have an effect on the calibration or when deemed necessary by Quality Control personnel.

The flow computation board calibration was verified on a weekly basis. If the variance of one counter exceeded ten counts from the average count or the calculated SCFM and the indicated SCFM exceed five counts, the flow computation board was adjusted.

On a daily basis a CVS System verification was performed using the propane recovery method as outlined in Title 40, Code of Federal Regulations, Part 86, Section 86.199-78(c). If the recovery was outside of the ± 2% tolerance, the problem was identified and

repaired. Two successive recoveries within ± 2% were obtained before testing began.

3. Analytical Bench

Monthly calibrations on all used analyzer ranges were conducted using seven gases spaced evenly over each range (e.g., zero, 15, 30, 45, 60, 75, and 90 percent of full scale). The gases used to calibrate the CO, CO_2 and NO_x analyzers are all single blend gases with nitrogren as the diluent. The gases used for the FID were single blend gases using propane with air as the diluent. All of the above gases were purchased from Scott Speciality Gases and were gravimetric blends with certified analysis (± 1%) and are traceable to NBS standards. An Aadco Model 737-13 pure air generator was verified weekly by cross-checks with compressed zero air with certified levels of impurities. A complete calibration was performed following maintenance or when curve checks were out of limits.

On a weekly basis all analyzer curves were checked using the span gas and three of the gravimetrics (e.g., 90, 60, and 30 % of full scale). If any of the readings exceeded ± 1% of the concentration for gases, above 50% of meter, the instrument received a complete calibration. On alternating weeks, 75, 45, and 15% gravimetrics were substituted in the procedure.

The entire analytical system was leak checked daily. Zero and span drift on all analyzer ranges measured and recorded, zero and span pot settings were recorded, NO_x converter efficiency was checked and CO analyzer vapor interference was checked using CO_2 bubbled through water. Propane recoveries were performed, span gas cylinder pressures recorded, HC hangup was checked and ambient HC and CO analysis was performed.

4. Soak Area Temperature Recorder and Wet Bulb/Dry

The temperature recorders were calibrated monthly by referencing the temperature sensors to a certified thermometer. They were checked at ambient, cool (approximately 60^0 F) and warm (approximately 90^0 F) temperatures. Response time was recorded. The recorder was checked daily at ambient temperatures.

5. Strip Chart Recorders

The chart speed and linearity of all emissions recorders and the driver's aide were checked weekly. Response time and deadband adjustments were also checked during this calibration. The data forms used for all calibrations and functional checks are included in Appendix D.

6. Quality Audit

In order to ensure that all calibrations were completed in a consistent manner and that no procedural or operational errors had occurred during the calibrations, each completed data sheet was audited by the EG&G-AR Quality Control Group.

SECTION VI

TESTS RESULTS

All test results were transferred to special data sheets (included in Appendix B) provided by the EPA. After review by the EPA, these packets were forwarded to Systex Inc., which was contracted by the EPA to process all data supplied by the Emission Factor testing contractors.

Because of this arrangement, EG&G-AR's contract required that test data not be included as part of the final report.

SECTION VII

DATA HANDLING

A. EMISSIONS TEST AUDITING AND VALIDATION

Upon completion of each vehicle test sequence, test data packets were reviewed by the Department Quality Control Auditor. This group is independent of testing operations. This review consisted of:

1. Checks for errors, omissions and legibility
2. Verification of time specifications.
3. Application of current calibration data and use of properly calibrated equipment.
4. Compliance with FTP specifications.

To ensure consistency and completeness of audits, a group of checklists was utilized. These checklists are located in Appendix E. When problems were discovered in the data packets, the packet was returned to the appropriate technician for corrections. If any inconsistencies could not be resolved, the test was invalidated.

B. TEST DATA TRANSMITTAL

After completion and review of each data packet, the packet was forwarded to Systex Inc., via United Parcel Services.

C. CALIBRATION DATA TRANSMITTAL

On a weekly basis a copy of all calibrations was sent to the EPA. This packet also included daily work summary logs, daily instrument checks and the barometric recording for the week. The packet included information generated from Monday to Sunday of each week. The monthly analytical instrument calibration curves were sent to Systex, Inc. as directed by the EPA. The remainder of the packets were sent to the Environmental Protection Agency.

APPENDIX A

Sample Procurement Packet

1) Letter of Introduction
2) Emission Factor Testing Program - Question and Answers
3) Telephone Questionnaire
4) Incoming Vehicles Inspection Sheet
5) Test Agreement
6) Standard Vehicle Loan Agreement
7) Savings Bond Information Sheet
8) Test Agreement Addendum
9) EG&G-AR Letter of Appreciation
10) EG&G-AR Letter of Acknowledgement for Response
11) Vehicle Owner Questionnaire Data Sheet
12) Newspaper advertisement for high mileage vehicles

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR MICHIGAN 48105

OFFICE OF
AIR, NOISE AND RADIATION

Dear Vehicle Owner:

As you may know, the Environmental Protection Agency and EG & G Automotive Research are conducting an important research program on air pollution from motor vehicles in San Antonio. You have been selected by a random, scientific sampling procedure as a possible participant in this program, which involves analyzing exhaust emissions from certain vehicles. We hope you will agree to take part in this important effort.

If your vehicle matches our research specifications, we will provide you with a late-model loaner car for the several days that your car is being examined by EG & G. Both your vehicle and the one being loaned to you will be insured. Your car will be returned to you with a full tank of gasoline and you will also receive a $100 United States Savings Bond as our way of thanking you for your help. Your participation in this research will be an important contribution toward solving this country's air pollution problems.

Please fill out and mail the enclosed postage-paid card as soon as you can. If you are willing to participate, a representative of EG & G will be in touch with you to ask a few questions about your vehicle. The enclosed information sheet answers some questions people often ask about this research program. If you have any additional questions about your participation, please feel free to call Mr. Kevin Kott of EG & G at 684-2310. He will be happy to answer any questions you may have.

We look forward to receiving your reply card very soon.

Sincerely,

Thomas C. Bejma, Project Officer
Emission Control Technology Division

Enclosures

EMISSION FACTOR TESTING PROGRAMS

Questions and Answers

1. Must I participate in this program?

   No, your cooperation in this research program is completely voluntary. If, for any reason, you decide not to participate, please let us know on the enclosed postpaid reply card.

2. Why should I participate?

   In addition to the free gasoline and a $100.00 U.S. Savings Bond, your participation will benefit you indirectly by helping EPA understand and improve the quality of the air in and around your city.

3. How long will the examination take?

   While the examination itself takes only about an hour, the vehicle must be completely cooled off before the examination can begin. This requires that the vehicle not be started for 12 to 36 hours to simulate overnight parking. Therefore, we will need to have your vehicle at the laboratory for two or three days. You will be contacted once the evaluation is complete so that arrangements can be made to pick up your vehicle. In general, we suggest that you plan to use the loaner car for three to four days.

4. Will my vehicle be mistreated in any way?

   No, every aspect of the evaluation has been designed to duplicate everyday operation.

5. Exactly what will be done to my vehicle?

   Once the vehicle is sufficiently cooled off, it will be pushed onto a dynamometer. Although the vehicle does not actually move during the examination, the dynamometer is a type of treadmill which simulates conditions which would normally be encountered on the road. A hose is connected to the exhaust pipe to collect the exhaust. A specially trained driver then starts the vehicle and "drives" it through a "driving cycle" which represents typical operation in urban, suburban, and rural areas. Throughout this time, a portion of the exhaust gases are collected for subsequent analysis. This analysis allows us to calculate the quantity of exhaust emissions emitted by your vehicle. Values for the city and highway fuel economy are also calculated. A complete inspection of the emission control components is conducted after the examination.

6. How many miles will my vehicle be driven during the program?

Your vehicle will be driven approximately 50 odometer miles during the examination. The majority of these miles will be accumulated indoors on the dynamometer. A 10 minute drive will precede the examination.

7. How will my vehicle be protected while in the contractor's possession?

In addition to the insurance provided by the contractor, your vehicle will be stored indoors while the examination is being conducted. If required to be parked outside, your vehicle will be located in a secure area.

8. What determines whether or not my vehicle will be ultimately selected?

Your vehicle has been initially identified by a statistically random sampling procedure. In order to obtain a cross section of the population of vehicles on the road, certain other criteria such as make, model and model year must be met. We are examining a limited number of vehicles that meet these particular specifications. If your vehicle meets these criteria, the final decision on whether your vehicle is selected will be based on a random process.

9. What happens to the information obtained from my vehicle?

The information collected as a result of this program is used to determine how the entire population of in-use vehicles is affecting air quality. The data from your vehicle are combined with data from several hundred other vehicles in this area in order to obtain a statistically valid sample.

10. How can I obtain the results from your examination of my vehicle?

After the completion of the examination you will be provided with a form to complete and return to us. This form has a space in which you may indicate your desire to obtain the results on your vehicle. We will forward them to you as soon as all the data have been processed.

Control No. _____
DATA FORM NO. 3344-A
Page 1 of 3

TELEPHONE QUESTIONNAIRE

Date _____ and time _____ of contact:

If owner was not contacted, list the number of attempts that have been made _____(eliminate after three attempts).

Individual Contacted: _____

If you were instructed to call back later, obtain convenient date _____ and time _____.

VEHICLE CONTROL NO. _____ TELEPHONE NO. _____

* Mr./Mrs. _____, you have been randomly selected from a list of 19_____ vehicle owners living in the San Antonio Metropolitan area. As the letter you recently received explains, a study of vehicle exhaust emissions is currently being conducted in this area by the United States Environmental Protection Agency and EG&G Automotive Research.

Your participation in this program is strictly voluntary. EPA is authorized by law to conduct this study and to offer incentives to you for your cooperation should you decide to participate.

Your cooperations will aid EPA's efforts to control air pollution due to vehicle exhaust.

The conditions for participation in this program are:

1) We ask you to bring your vehicle into our testing facility, which is located at 5404 Bandera Road. You will receive a late model loaner vehicle which will have a full tank of gas. This vehicle is yours to use for the duration of the testing program which will take approximately 3 to 4 working days. During this time we will be conducting a series of exhaust emissions test on your vehicle.
2) At the completion of our testing, if a full program has been performed, your vehicle will be returned to you with a tune-up and oil change (if required) and a full tank of gas. You will also receive a $100.00 U.S. Savings Bond for your cooperation in this study.

_____

* If individual listed on the reply card was not contacted, enter name of person you talked with and indicate relationship i.e. husband, wife, son, daughter, friend, etc.

Telephone Questionnaire

Prior to releasing your vehicle into our possession you will be given some documents to sign. These documents, which will also be signed by an authorized EG&G Automotive Research representative, will define in detail these areas:

1) Initial Inspection form which will document the overall interior and exterior condition of your vehicle when received.

2) Test Agreement form which explains what sequence of tests your vehicle will be given and assign full liability responsibilities to EG&G Automotive Research for your vehicle while in our possession.

3) Loaner Car Agreement explains the terms and liability responsibilities for both parties in relation to the loaner vehicle.

4) Savings Bond information sheets. This form when completed will contain all the information necessary for a Savings Bond to be issued in your name.

Do you think you would be willing to participate in this program? _____ Yes _____No

IF RESPONSE IS POSITIVE

For the purpose of identifying your vehicle as a possible candidate for this study, I am going to ask you a few question. None of this information can be used against you in any way and you should answer these questions to the best of your knowledge. Please indicate when you are not sure of something.

1) What is the made, model, year, transmission type, vehicle identification number and engine size?

MAKE_____ MODEL_____ YEAR_____

TRANS: AUTO_____ MANUAL_____ V.I.N._____

ENGINE_____

2) What is the approximate odometer reading:_____

3) Has your vehicle ever been involved in an accident? _____ Yes _____ No
If the answer is yes, indicate the type and extent of damage, i.e. frame, engine, drive train, cooling system, exhaust system, etc.

_____

_____

_____

Telephone Questionnaire

4) Because this is an exhaust emissions test, it is critical that the exhaust systems on the vehicle tested be in good condition. To your knowledge, are the exhaust pipes, muffler and catalyst on your vehicle in good condition with no leaks or holes. _____ Yes _____ No

IF NO

Would you consider making the necessary repairs or replacements to your exhaust system at your own expense in order to participate in this program? _____ Yes _____No

IF NO ELIMINATE

If Yes try to obtain an estimate of when these repairs will be completed _____.

This should supply all of the information needed to determine if your vehicle is acceptable.

This information will have to be reviewed by the Project Manager and a decision should be made within the next few days. We will notify you as soon as possible.

Is it convenient for you if we contact you at this same number and time when the decision is made. _____ Yes _____ No

IF NO, obtain number and time _____.

Thank you very much for your cooperation.

INCOMING VEHICLE INSPECTION SHEET
PART II

TIRES:_____ RADIAL OR_____BIAS

ENGINE SIZE:_____

BODY STYLE:_____

YEAR:_____

MAKE/MODEL:_____

A/C_____ OR NONE A/C_____

VEHICLE NUMBER:_____

*PLEASE GIVE JOHN R. INFORMATION

Fuel Tank Cap:_____ Trans._____

Oil_____

Date_____

Time_____

EG&G AUTOMOTIVE RESEARCH, INC.

5404 BANDERA ROAD SAN ANTONIO TEXAS 78238 • TEL(512)684-2310 TWX 910-871-1075

Control No._____
Form No. 302.1

TEST AGREEMENT

Your vehicle is being loaned to EG&G AUTOMOTIVE RESEARCH, INC., for use in a government-sponsored program for cleaner air. This executed Agreement is your assurance of full protection against any loss sustained by accident or damage to the vehicle while in the possession of EG&G AUTOMOTIVE RESEARCH, INC., or its designed representatives.

EG&G AUTOMOTIVE RESEARCH, INC., agrees to be fully responsible for any and all damage to the vehicle occurring while the vehicle is in its possession. Possession is hereby defined as care, control, custody, operation, inspection, or storage between the time the vehicle is received from the owner by EG&G AUTOMOTIVE RESEARCH, INC., and the time the vehicle is returned to the owner.

EG&G AUTOMOTIVE RESEARCH, INC., agrees to indemnify and hold harmless the vehicle owner of any repairs, damage, loss, or liability sustained by the vehicle owner by reason of accident or damage to the vehicle while in its possession.

EG&G AUTOMOTIVE RESEARCH, INC., agrees to provide primary automobile insurance on the vehicle while in its possession.

EG&G AUTOMOTIVE RESEARCH, INC., agrees to exercise extreme care in the use of the vehicle and agrees to return the vehicle to the owner in as good exterior, interior, and operating condition, except for normal wear and tear, as when the vehicle was received by EG&G AUTOMOTIVE RESEARCH, INC.

EG&G AUTOMOTIVE RESEARCH, INC., reserves the right to perform any repairs and maintenance upon the vehicle, at its sole discretion, provided all such repairs and maintenance are performed according to the manufactureres specifications.

I, _____, agree to loan my vehicle, described as a _____(Year) _____(Make and Model), registered in the State of _____ under License Plate No. _____ to EG&G AUTOMOTIVE RESEARCH, INC., for a period of approximately _____ days for a series of tests. I further agree that, should testing not be completed within the time period specified above, I will execute the Agreement Renewal which is an addendum to this Agreement, for the additional time required to complete testing. I understand that I may refuse to loan the vehicle to EG&G AUTOMOTIVE RESEARCH, INC., at any time and that I am under no obligation whatsoever.

AGREED TO this _____ day of _____, 198__.

VEHICLE OWNER: EG&G AUTOMOTIVE RESEARCH

By:_____ By:_____

Control No. _____
Data Form No. 3026.4

STANDARD VEHICLE LOAN AGREEMENT

THIS STANDARD VEHICLE LOAN AGREEMENT (the "Agreement") is made and entered into by and between Mr./Mrs./Miss/Ms._____ of _____, _____ County, State of Texas (referred to in this Agreement as the "Participant"), and EG&G Automotive Research, Inc., a Texas corporation having a usual place of business at 5404 Bandera Road, City of San Antonio, Bexar County, State of Texas (referred to in this Agreement as "Automotive Research").

W I T N E S S E T H T H A T

WHEREAS: Automotive Research has entered into a contract with the United States Environmental Protection Agency under which Automotive Research will borrow cars from the public and test those cars to determine the effectiveness of their emissions control systems; and

WHEREAS: The Participant has agreed to let Automotive Research test the Participant's car on the condition that Automotive Research lend the Participant a car to use during the period of such tests; and

WHEREAS: Automotive Research is willing to lend a car to the Participant and the Participant is willing to accept the loan of such car (such car being referred to in this Agreement as the "Car") all on the terms and conditions hereinafter set forth,

NOW, THEREFORE: In consideration of the mutual covenants and agreements set forth in this Agreement, Participant and Automotive Research do hereby contract, covenant and agree as follows:

1. Automotive Research lends to and the Participant hereby accepts the loan of the Car whose license number and condition are set forth in the box at the bottom of the last page of this Agreement.

2. Participant agrees to exercise care in the use of the Car and agrees to return the Car to Automotive Research within forty-eight (48) hours, or two (2) working days, after notification of the completion of the tests on the Participant's own car, but in no event later than ten (10) days from the date of execution of this Agreement. Upon its return, the Car will have with it all tires, tools, and other accessories now contained in or installed on the Car. The Car and all such tires, tools, and accessories will, upon return, be in as good exterior and interior repair and operating condition as they now are and as is indicated in the box at the bottom of the following page, except for wear and tear caused by normal use and except for damage caused by casualty.

3. Participant agrees that the Car will not be operated to carry passengers or property for any money or other consideration, expressed or implied, or to push or tow any other vehicle or trailer. The Car will be operated only by Participant and permitted members of his immediate family, and provided that all such operators shall be duly qualified and licensed.

4. Participant agrees to be liable for: (a) all charges, fines, and costs for parking, traffic, or other legal violations assessed against the Car, Participant, or Automotive Research, except where caused through fault of Automotive Research; (b) Automotive Research's costs including reasonable attorney's fees, where permitted by law, incurred collecting payments due from Participant hereunder; (c) Automotive Research's costs to repair collision damages to the Car caused by the negligence or willful misconduct of the operator; provided, however, that Participant's liability for such damage will not exceed $100.00.

5. Participant and any authorized operator agree to participate as an insured in benefits of an automobile liability insurance policy, a copy of which is available from Automotive Research. Said policy comes before any other insurance carried by Participant or authorized operator and contains bodily injury or death liability limits of $250,000 for each person in each accident and is subject to the following limitations: A $500,000 limit for all persons in each accident and a property damage liability limit of $50,000 for each accident. Participant is bound by and agrees to the terms, conditions, limitations, and restrictions of said policy; it being understood that the policy is a standard Texas motor vehicle policy.

6. Participant releases Automotive Research from any liability for loss of or damage to any property left, stored, or transported by Participant or any other person in or upon the Car, during the term of this loan, or after return of the Car to Automotive Research.

TO WITNESS this Agreement, the Participant has signed below and Automotive Research has caused the Agreement to be executed by its authorized representative, all under seal, as of the _____ day of _____, 196__, in the city of San Antonio, Texas.

PARTICIPANT: EG&G AUTOMOTIVE RESEARCH, INC.:

By:_____

Driver's License #_____

Expiration Date_____ By:_____

CAR AND CONDITION

DATE:_____

Loan Car License No: _____

Loan Car Condition: OUT_____OK/Initial

DATE_____ IN _____OK/Initial

Defects noted when Car was received by Participant:_____

_____

Control No. _____
DATA FORM NO. 3024.4

Control No. _____
DATA FORM NO. 3024.3

EG&G AUTOMOTIVE RESEARCH, INC.
5404 Bandera Road
San Antonio, Texas 78238

SAVINGS BOND INFORMATION

NAME		SOCIAL SEC. NO.
STREET ADDRESS		
CITY	STATE	ZIP
HOME TELEPHONE NO.	BUSINESS TELEPHONE NO.	
THE FOLLOWING PERSON, IF ANY, IS TO BE		___ OWNER ___ CO-OWNER ___ BENEFICIARY
NAME		SOCIAL SEC. NO.
MAILING ADDRESS (IF DIFFERENT THAN ABOVE)		
CITY	STATE	ZIP

CLASS/SERIAL NO.	
CODE NO.	
YEAR/MAKE OF VEHICLE	
MODEL OF VEHICLE	
ACCEPTED	REJECTED
BOND NO.	ISSUE DATE
REMARKS	

TEST AGREEMENT ADDENDUM

I, _____ owner( ) and/or joint-owner( ) and/or principal driver( ) of the vehicle described as a (Year)_____ (Make and Model)_____, registered in the State of _____, agree to extend original testing agreement dated_____, 19_____ for a period of _____ days.

VEHICLE OWNER

By:_____

Date:_____

EG&G AUTOMOTIVE RESEARCH, INC.
5404 BANDERA ROAD, SAN ANTONIO, TEXAS 78238 • TEL(512)684-2310 TWX 910-871-1075

Dear Participant:

This letter is to express my thanks to you for your recent participation in the exhaust emissions testing program which EG&G AUTOMOTIVE RESEARCH, INC., is conducting on behalf of the Environmental Protection Agency.

In addition to the tank of gas, savings bond and use of a loan car which you have received as incentives for your cooperation in this effort, we may have performed maintenance items on your vehicle according to the manufacturer's specifications. Attached for your records is a detailed summary of any maintenance performed on your car while in our laboratory.

Again, thank you very much for your kind cooperation in this important effort.

Sincerely,

Mark D. Dalen
Project Manager

MDD/bh

Attachment

EG&G AUTOMOTIVE RESEARCH, INC.
5404 BANDERA ROAD, SAN ANTONIO, TEXAS 78238 • TEL(512)684-2310 TWX 910-871-1075

Dear Vehicle Owner:

Thank you for your response to our recent inquiry on your vehicle. This information will be valuable in our overall data gathering process.

Unfortunately, your vehicle does not meet all of the specifications and requirements for this particular study and can not be used in the actual testing phase at this time.

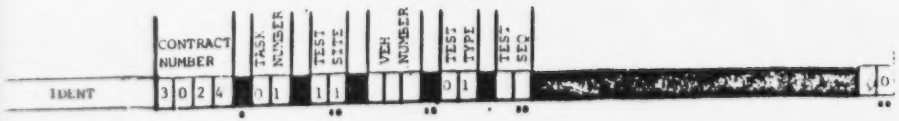
Again, we would like to express our appreciation for your timely response.

Sincerely,

Mark D. Dalen
Project Manager

MDD/bh

VEHICLE OWNER QUESTIONNAIRE
DATA SHEET



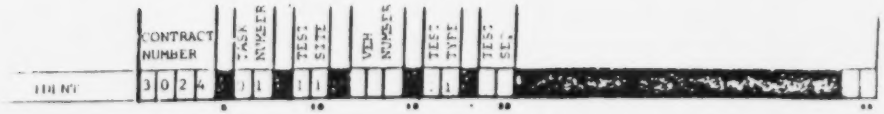
1)	What is the brand name of the fuel you normally use (see list below)?	(1-4)
2)	Have you, or others, ever noticed a hydrogen sulfide (rotten eggs) odor in the vehicle exhaust?	1 (never) 2 (seldom) 3 (occasionally) 4 (frequently) 5 (don't know) (5)
3)	Have you ever used gasohol in this vehicle?	1 (never) 2 (seldom) 3 (occasionally) 4 (frequently) 5 (don't know) (6)
4)	If you have used gasohol, a) Have you noticed any difference in the vehicle performance?	1 (never used gasohol) 2 (perf. is better) 3 (perf. is worse) 4 (no difference) 5 (don't know) (7)
	b) Have you noticed any difference in fuel economy?	1 (never used gasohol) 2 (fuel economy better) 3 (fuel economy worse) 4 (no difference) 5 (don't know) (8)
5)	How long ago did you purchase the vehicle to be tested?	1 (0-1 months) 2 (1-12 months) 3 (1-2 years) 4 (over 2 years) (9)

DATA ENTRIES FOR QUESTION #1

ENTER	BRAND NAME	ENTER	BRAND NAME	ENTER	BRAND NAME	ENTER	BRAND NAME	ENTER	BRAND NAME	ENTER	BRAND NAME
AMOC	AMOCO	CLAR	CLARK	FINA	FINA	MOBI	MOBIL	SHEL	SHELL	UNIO	UNION
ARCO	ARCO	CONO	CONOCO	GENC	GENCO	MOTO	MOTOR	SINC	SINCLAIR	VICK	VICKERS
ASHL	ASHLAND	CROW	CROWN	GULF	GULF	PENN	PENNEYS	SITE	SITE	WARD	WARDS
BONA	BONAFIDE	DERB	DERBY	HESS	HESS	PHIL	PHILLIPS	SKEL	SKELLY	ZEPH	ZEPHYR
BP	BP	ENCO	ENCO	HUDS	HUDSON	SCOT	SCOTT	STAN	STANDARD	**	OTHER
CHEV	CHEVRON	ESSO	ESSO	MARS	MARS	SEAR	SEARS	SUNO	SUNOCO	UNKN	UNKNOWN
CITC	CITCO	EXXO	EXXON	MART	MARTIN	SHAM	SHAMROCK	TEXA	TEXACO	VARI	VARIOUS

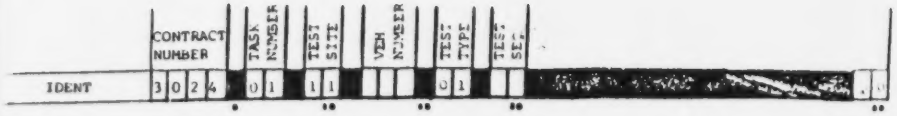
** IF BRAND IS 'OTHER', THEN ENTER THE FULL BRAND NAME VEHICLE OWNER USES.

VEHICLE OWNER QUESTIONNAIRE
DATA SHEET



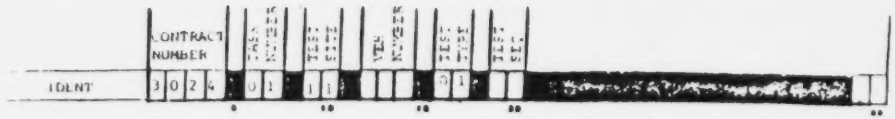
6)	On a yearly basis, how many thousands of miles is this vehicle driven?		1 (0-5) 2 (5-10) 3 (10-15) 4 (15-20) 5 (20-30) 6 (over 30)
7)	Where is the driving done? almost all: >75% most: 75-51% some: 50-21% little or none: <21%	a) City expressways	1 (almost all) 2 (most) 3 (some) 4 (little or none)
		b) Major city streets	1 (almost all) 2 (most) 3 (some) 4 (little or none)
		c) Other city streets	1 (almost all) 2 (most) 3 (some) 4 (little or none)
		d) Rural expressways	1 (almost all) 2 (most) 3 (some) 4 (little or none)
		e) Other rural roads	1 (almost all) 2 (most) 3 (some) 4 (little or none)
8)	How is the driving done? almost all: >75% most: 75-51% some: 50-21% little or none: <20%	a) To and from work	1 (almost all) 2 (most) 3 (some) 4 (little or none)
		b) Shopping and errands	1 (almost all) 2 (most) 3 (some) 4 (little or none)
		c) Business (not to and from work)	1 (almost all) 2 (most) 3 (some) 4 (little or none)
		d) Other (social, vacations, etc.)	1 (almost all) 2 (most) 3 (some) 4 (little or none)
9)	How did you get here today?		1 (city streets only) 2 (some expressway) 3 (primarily expressway)
		Approx. miles	

VEHICLE OWNER QUESTIONNAIRE
DATA SHEET



10) How is this vehicle used? almost all: ≥ 75% most: 75-51% some: 50-21% little or none: ≤ 20%	a) Driver only	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(23)
	b) Driver and one passenger	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(24)
	c) Driver and 2 or more passengers	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(25)
	d) Driver only with heavy cargo	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(26)
	e) Driver, passenger and cargo	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(27)
	f) Towing a trailer	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(28)
11) On a typical day, how many trips are made with this vehicle? (One trip is defined as starting the engine, traveling some distance and stopping the engine).		☐☐	(29-30)
12) On a weekly basis, how often is full throttle acceleration used?		1 (seldom) 2 (once or twice) 3 (3-6 times) 4 (every day)	(31)
13) Do you now experience any engine performance problems with this vehicle?	a) Hard starting	1 (yes) 2 (no)	(32)
	b) Stalling	1 (yes) 2 (no)	(33)
	c) Rough idle	1 (yes) 2 (no)	(34)
	d) Engine misfiring	1 (yes) 2 (no)	(35)
	e) Poor acceleration	1 (yes) 2 (no)	(36)
	f) Stumbling	1 (yes) 2 (no)	(37)
	g) Hesitation	1 (yes) 2 (no)	(38)
	h) Engine knock or ping	1 (yes) 2 (no)	(39)
	i) Dieseling (after run)	1 (yes) 2 (no)	(40)

VEHICLE OWNER QUESTIONNAIRE
DATA SHEET

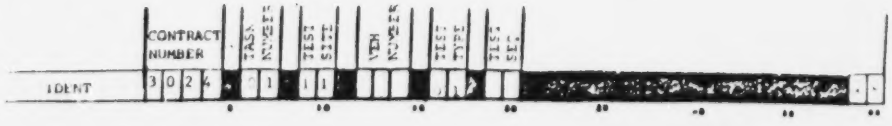


14) Overall, are you reasonably satisfied with the engine performance of this vehicle?	1 (yes) 2 (most of the time) 3 (no)	(41)
15) How long ago was the last oil change?	1 (too new, not due) 2 (due, but not yet done) 3 (0-6 months ago) 4 (6-12 months ago) 5 (over 1 year ago) 6 (don't know)	(42)
16) If you purchased the vehicle under warranty, how many times has it been returned for warranty repairs?	1 (no warranty) 2 (never returned) 3 (twice) 4 (3 or more) 5 (don't know)	(43)
17) What was the nature of the warranty repair?	1 (no warranty) 2 (never returned) 3 (recall) 4 (driveability) 5 (other)	(44)
18) Have you had any repairs to your vehicle for the correction of driveability problems?	1 (yes) 2 (no problems)	(45)
19) What repairs were performed on your vehicle to correct the driveability problems? Specify _____	1 (none) 2 (carburetor) 3 (engine) 4 (emission control system) 5 (ignition system) 6 (other) 7 (don't know)	(46)
20) How long ago were these repairs accomplished?	1 (no repairs) 2 (0-3 months) 3 (3-6 months) 4 (over 6 months) 5 (don't know)	(47)
21) Were these repairs effective in correcting the driveability problems?	1 (no repairs) 2 (yes) 3 (no)	(48)
22) Is this vehicle operated regularly on unpaved roads, in competitive events, or in hauling or transporting loads heavier than for which it was designed?	1 (yes) 2 (no) 3 (don't know)	(49)

VEHICLE OWNER QUESTIONNAIRE
DATA SHEET

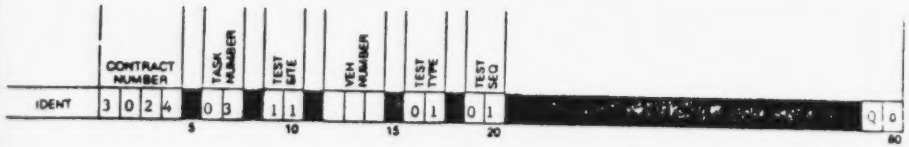
23) Has the vehicle ever had major damage in any of the following areas?	a) Engine	1 (yes) 2 (no)	(50)
	b) Cooling system	1 (yes) 2 (no)	(51)
	c) Fuel system	1 (yes) 2 (no)	(52)
	d) Exhaust system	1 (yes) 2 (no)	(53)
	e) No damage	1 (yes) 2 (no)	(54)
	f) Don't know	1 (yes) 2 (no)	(55)
24) Has the catalytic converter ever been replaced on this vehicle?		1 (no catalyst) 2 (yes) 3 (no) 4 (don't know)	(56)
25) Was the vehicle tested in a previous EPA program?		1 (yes) 2 (no)	(57)
26) Has any maintenance performed since the last test?		1 (yes) 2 (no) 3 (not tested)	(58)
27) What type of maintenance was performed?		1 (warranty) 2 (tune-up) 3 (none) 4 (not tested)	(59)
28) How much did the maintenance cost? 001 - 998 maintenance 000 don't know 999 not tested			(60-62)
29) Who performed the maintenance?		1 (no maintenance) 2 (dealer) 3 (independent garage) 4 (tune-up clinic) 5 (yourself) 6 (not tested)	(63)

VEHICLE OWNER QUESTIONNAIRE
DATA SHEET



30) Do you accurately keep records of the fuel economy on this vehicle?	1 (yes) 2 (no)	(64)
31) Are you concerned with the fuel economy of this vehicle?	1 (yes) 2 (no)	(65)
32) Date of last city or state inspection 99/99 : don't know 00/00 : not required 00/00 : never inspected	a) Month b) Year	(66-67) (68-69)
33) Did your vehicle pass or fail the inspection?	1 (pass) 2 (fail) 3 (don't know) 4 (not required) 5 (never inspected)	(70)
34) a) Does your odometer indicate the true number of miles on your car?	1 (yes) 2 (no)	(71)
b) If no, specify approximate total number of miles this vehicle has been driven		(72-75)

VEHICLE OWNER QUESTIONNAIRE
DATA SHEET



A)	How often is the car we are testing tuned up?	1 (at least every six) months) 2 (7 to 12 months) 3 (Less often than once per year) 4 (According to owners manual) 5 (Too new to be tuned) 6 ("When Needed") 7 (Other) 8 (Don't Know) 9 (Not Applicable)	(1)
B)	How long ago was the last tune up?	1 (6 months or less) 2 (7 to 12 months) 3 (longer than 12 months) 8 (Don't Know) 9 (Not Applicable)	(2)
C)	Who did the last tune up?	1 (car dealer) 2 (service station) 3 (independent garage) 4 (self or other family member) 7 (Other) 8 (Don't Know) 9 (Not Applicable)	(3)
D)	We are interested in the fuel economy people actually get with their cars. How many miles per gallon do you get with this car? (Enter "98" if Don't Know) (Enter "99" if Not Applicable)	a) in the city? ____ b) on the highway ____ c) combined city & highway	(4-5) (6-7) (8-9)

VEHICLE OWNER QUESTIONNAIRE
DATA SHEET

E)	Has unleaded gasoline usually been used in this car?		1 (Yes) 2 (No) 8 (Don't Know) 9 (Not Applicable)	(10)
F)	Unleaded gas is more expensive than leaded and at times has been hard to find.	a) Have you ever used leaded gasoline in this car?	1 (yes) 2 (no) 8 (don't know) 9 (Not Applicable)	(11)
		b) If yes, how often?	50 (50 or more) 51 (Never) 52 (Seldom) 53 (Occasionally) 54 (Frequently) 99 (Don't Know or not Applicable)	(12-13)
G)	Is regular or premium used?		1 (Regular) 2 (Premium) 7 (Other) 8 (Don't Know) 9 (Not Applicable)	(14)

Q 2
80

EG&G AUTOMOTIVE RESEARCH, Inc.
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VEHICLES NEEDED FOR RESEARCH PROGRAM

1981 CARS WITH OVER 25,000 MILES

1980 CARS WITH OVER 40,000 MILES

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IF YOU OWN ONE OF THESE VEHICLES AND WOULD LIKE TO BE A PART OF THIS COUNTRY'S EFFORT TO CONTROL AIR POLLUTION, YOU WILL BE PROVIDED WITH:

1. A LATE MODEL LOANER CAR FOR YOUR USE WHILE YOUR CAR IS BEING TESTED.
2. BOTH YOUR VEHICLE AND THE ONE BEING LOANED TO YOU WILL BE FULLY INSURED.
3. YOUR CAR WILL BE RETURNED TO YOU WITH A FULL TANK OF GAS.
4. YOU WILL RECEIVE A $100 SAVINGS BOND.

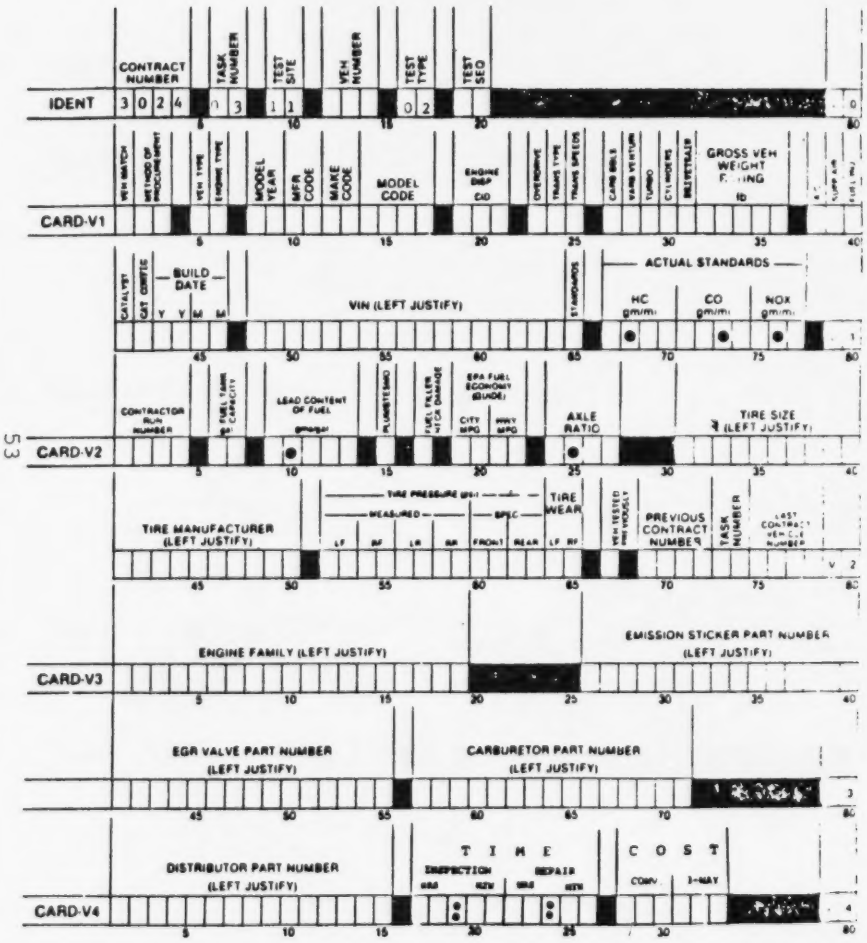
CALL US TODAY 684-2310 EXT. 317 FOR ADDITIONAL INFORMATION.

APPENDIX B

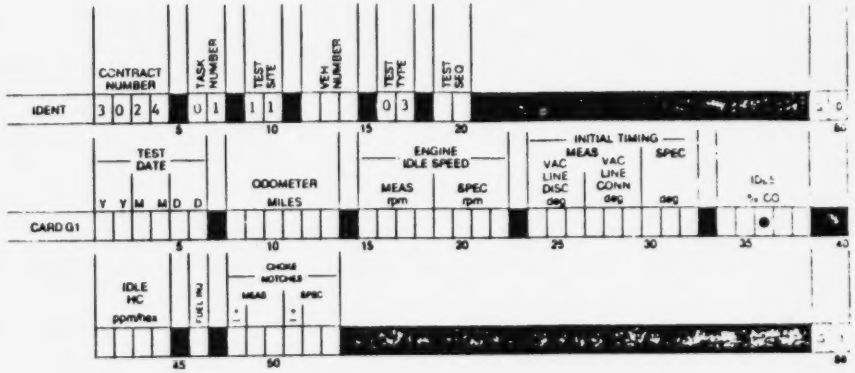
EPA Vehicle Data Packet

1) Vehicle Information Data Sheet
2) Engine Parameter Data Sheet
3) Vehicle Information Data Sheet
4) Mechanic's Inspection Form
5) FTP Test Data
6) Highway Fuel Economy Test Data Sheet
7) Bag Idle and 50 MPH Cruise Test Data Sheet
8) Four Mode and Loaded Two Mode Test Data Sheet
9) Propane Gain Data Sheet
10) Comments Data Sheet
11) Driveability Evaluation Data Sheet
12) Emission Component Data Sheet

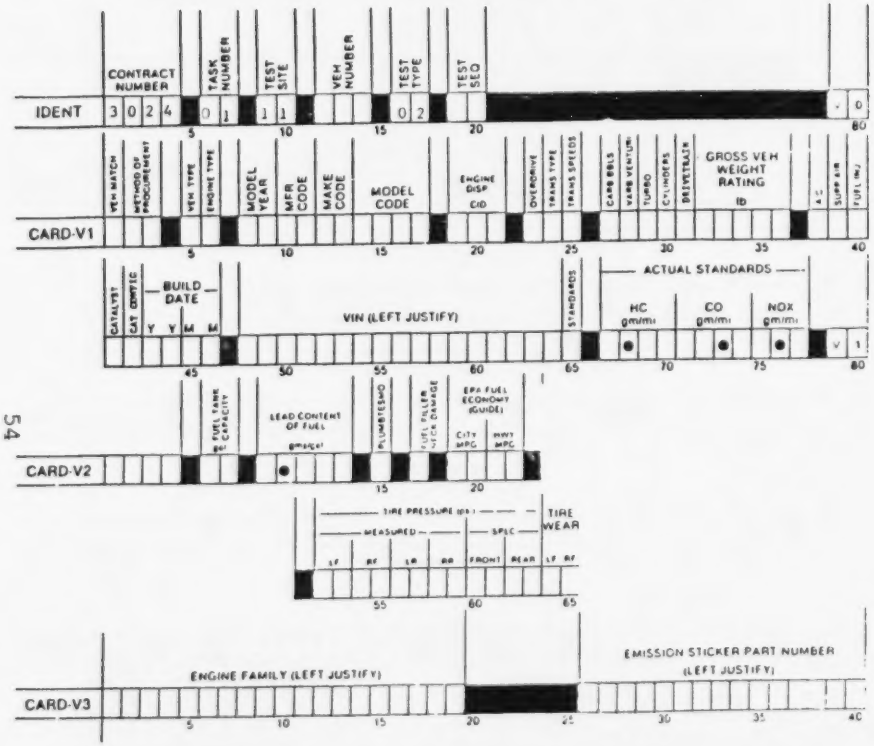
VEHICLE INFORMATION DATA SHEET



ENGINE PARAMETER DATA SHEET



VEHICLE INFORMATION DATA SHEET



Control No. _____
DATA FORM NO. 3244-7
Page 1 of 12

MECHANICS INSPECTION FORM

VEHICLE NO. _____

Fuel Filler Neck Damage _____

1 - Yes, Unleaded fuel vehicle
2 - No, Unleaded fuel vehicle
3 - N/A, Leaded fuel acceptable

AXLE RATIO _____

TIRE SIZE _____

TIRE MANUFACTURER _____

EGR VALVE PART NUMBER _____ (Includes all spaces, slashes, dashes, etc.)

CARBURETOR PART NUMBER _____ (Includes all spaces, slashes, dashes, etc.)

DISTRIBUTOR PART NUMBER _____ (Includes all spaces, slashes, dashes, etc.)

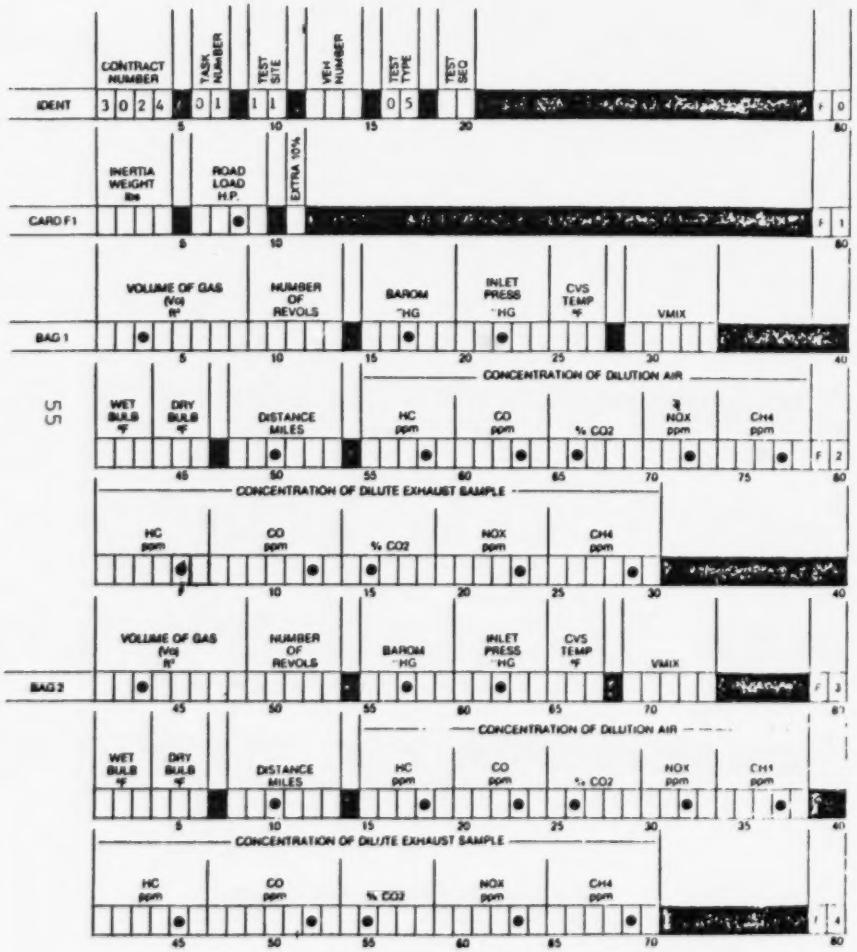
MECHANIC _____

INSPECTION DATE _____

FTP AND EVAP TEST DATA SHEET

FTP TEST DATA

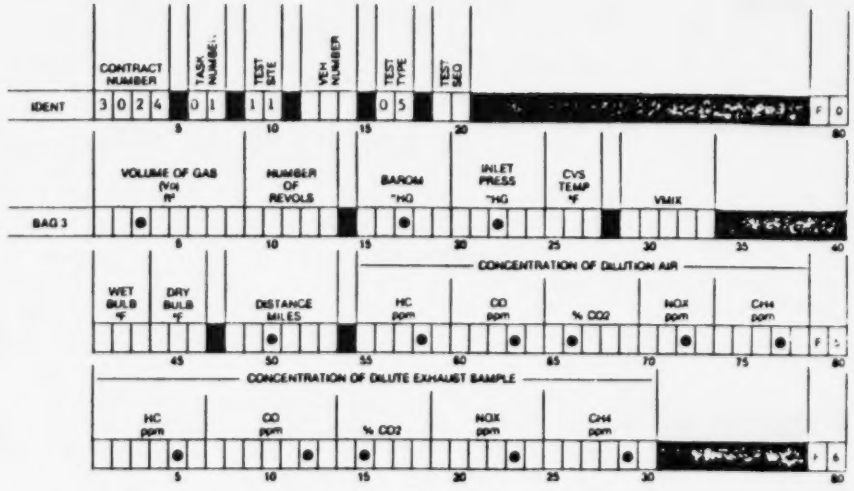
Page (1 of 2)



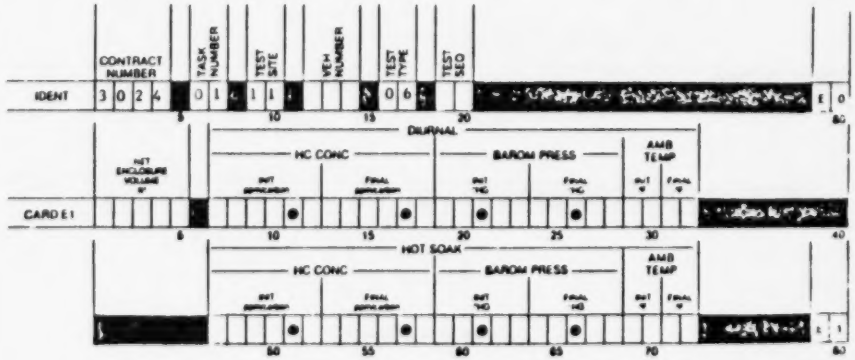
FTP AND EVAP TEST DATA SHEET

FTP TEST DATA (continued)

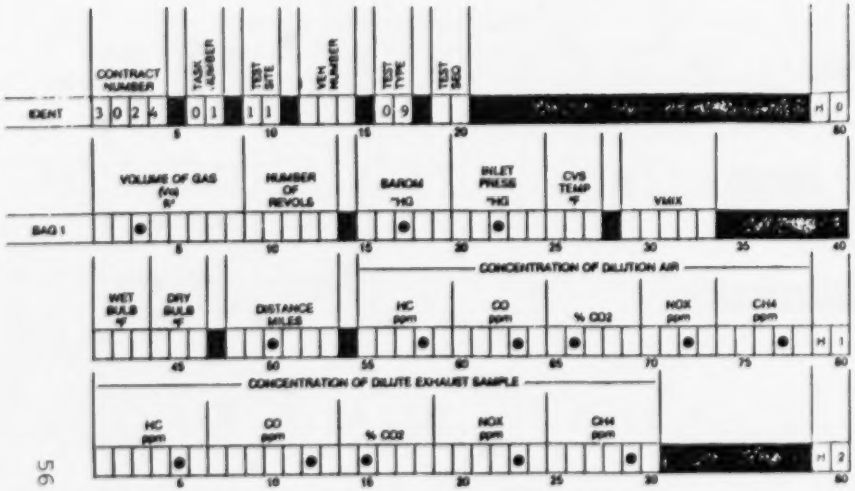
Page (2 of 2)



EVAP TEST DATA

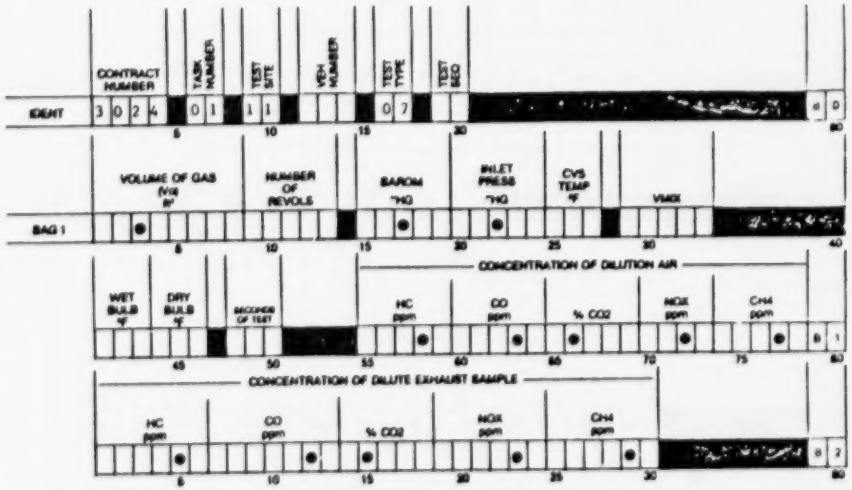


HIGHWAY FUEL ECONOMY TEST DATA SHEET

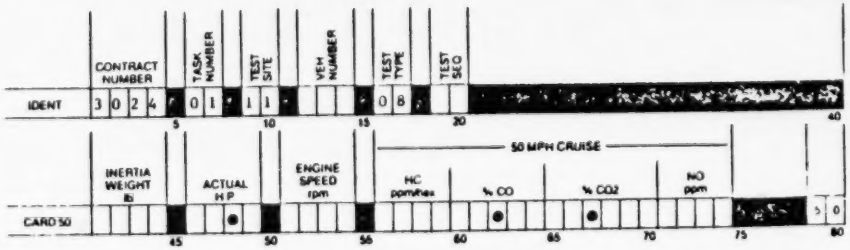


BAG IDLE AND 50 MPH CRUISE TESTS DATA SHEET

BAG IDLE TEST DATA

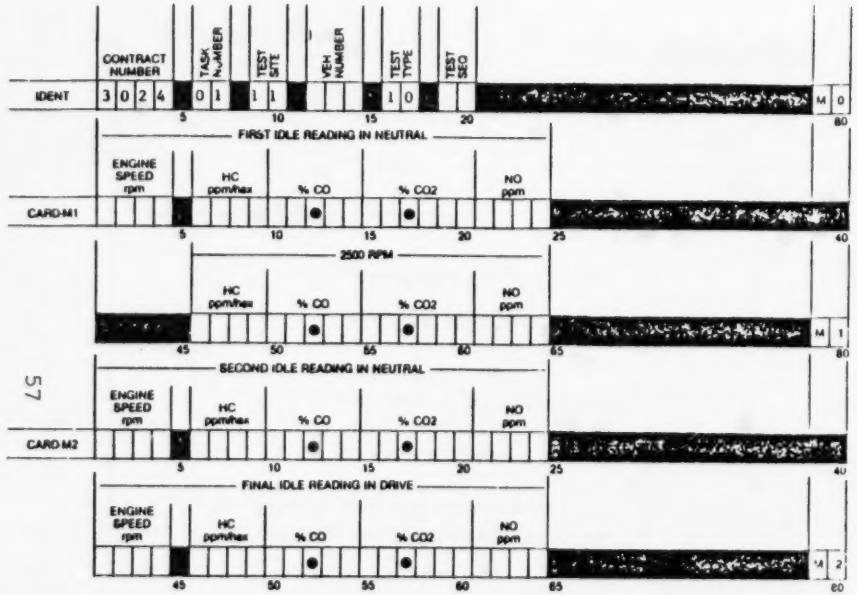


50 MPH CRUISE DATA

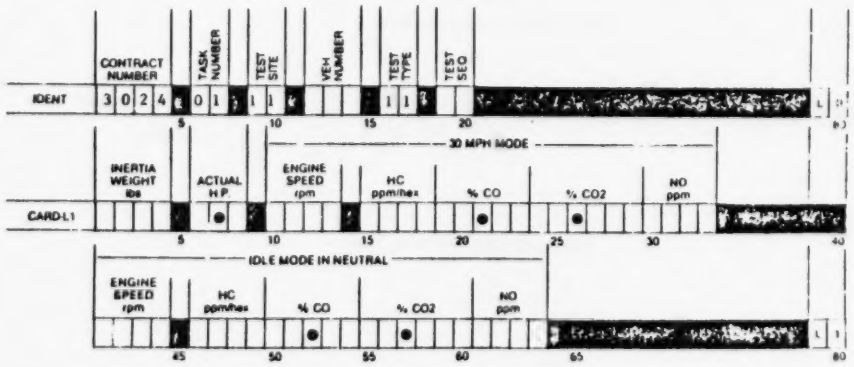


FOUR MODE IDLE AND LOADED TWO MODE TESTS DATA SHEET

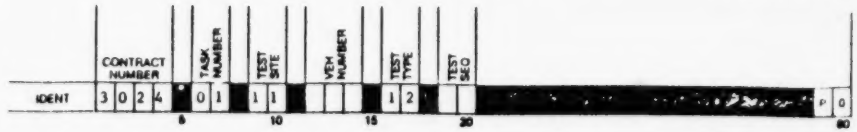
FOUR MODE IDLE TEST DATA



LOADED TWO MODE TEST DATA



PROPANE GAIN DATA SHEET

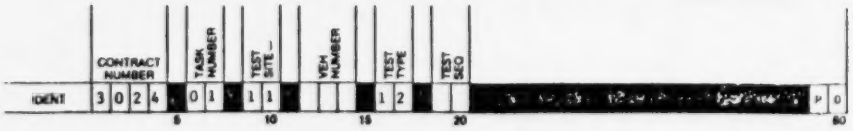


3-WAY CLOSED LOOP

		IN NEUTRAL	IN DRIVE
STEP 1	PRESET FLOW RATE		
STEP 2	RECORD: a) FLOW RATE	1	2
	b) RPM	5	10
	c) IDLE %CO	15	20
STEP 3	INDUCE PROPANE, OBSERVE VEHICLE BEHAVIOR RECORD ONE: a) RPM RISES SMOOTHLY TO	25	30
	b) RPM FALLS SMOOTHLY TO	35	40
	c) ENGINE RUNS ROUGH AND THEN STABILIZES (1-YES)	43	44
	d) ENGINE DIES (1-YES)	45	46
	e) RPM STAYS THE SAME (1-YES)	47	48
STEP 4	WHEN ENGINE STABILIZES, RECORD:		
	a) RPM	50	55
	b) IDLE %CO	60	65
		P	1
		80	

(Continues on Next Page)

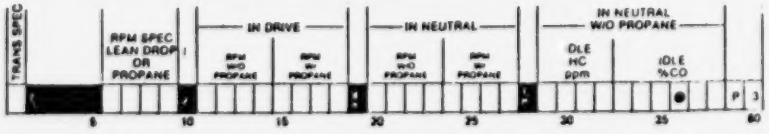
PROPANE GAIN DATA SHEET



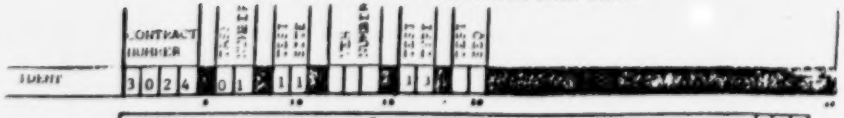
3-WAY CLOSED LOOP (Continued)

		IN NEUTRAL	IN DRIVE
STEP 5	WITHDRAW PROPANE, OBSERVE VEHICLE BEHAVIOR RECORD ONE: a) RPM RISES SMOOTHLY TO	5	10
	b) RPM FALLS SMOOTHLY TO	15	20
	c) ENGINE RUNS ROUGH AND THEN STABILIZES (1-YES)	21	22
	d) ENGINE DIES (1-YES)	23	24
	e) RPM STAYS THE SAME (1-YES)	25	26
STEP 6	WHEN ENGINE STABILIZES, RECORD:		
	a) RPM	30	35
	b) IDLE %CO	40	45
		P 2	
		80	

VEHICLES OTHER THAN 3-WAY CLOSED LOOP



DRIVEABILITY EVALUATION DATA SHEET

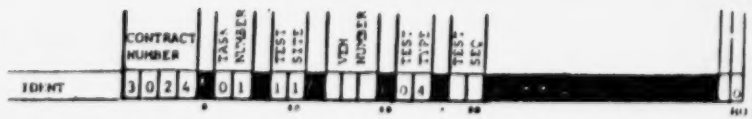


AMBIENT TEMPERATURE °F		(41-43)
ROAD CONDITION (1-DRY 2-WET 3-ICY 4-SNOW)	1 2 3 4	(44)
CONSTANT SPEED PHASE		
NUMBER OF STALLS, PASS-OUTS UPON PART THROTTLE ACCELERATION TO ROAD SPEED		(45)
ACCELERATION QUALITY	1 2 3 4 5	(46)
CRUISE QUALITY	1 2 3 4 5	(47)
SLIGHT ACCELERATION RESPONSE (PASSING)	1 2 3 4 5	(48)
IDLE QUALITY AT STOP WITH A/C 'ON'	1 2 3 4 5	(49)
IDLE QUALITY AT STOP WITH A/C 'OFF'	1 2 3 4 5	(50)
ACCELERATION FROM STOP PHASE		
QUALITY OF ACCELERATION UNDER 1/4 THROTTLE	1 2 3 4 5	(51)
QUALITY OF ACCELERATION UNDER 1/2 THROTTLE	1 2 3 4 5	(52)
QUALITY OF ACCELERATION UNDER 2/3 THROTTLE	1 2 3 4 5	(53)
QUALITY OF ACCELERATION UNDER 3/4 THROTTLE	1 2 3 4 5	(54)
RESTART PHASE		
CRANKING TIME TO START AFTER 10 MIN (IN SECONDS)		(55-56)
IDLE QUALITY AFTER RESTART	1 2 3 4 5	(57)

COLD START AND IDLE PHASE (DYNAMOMETER)		
INITIAL CRANKING TIME (IN SECONDS)		(58-59)
NUMBER OF ENGINE IDLE-OUTS AFTER START		(60)
NUMBER OF ENGINE STALLS AFTER GEAR SELECTION		(61)
HESITATION, LAG UPON SLIGHT ACCELERATION (1-YES 2-NO)	1 2	(62)
IDLE QUALITY	1 2 3 4 5	(63)
DRIVE AWAY PHASE (DYNAMOMETER)		
NUMBER OF STALLS, PASS-OUTS UPON SLIGHT ACCELERATION TO ROAD SPEED		(64)
ACCELERATION QUALITY	1 2 3 4 5	(65)
IDLE QUALITY AFTER 0.2 MILE FROM STOP	1 2 3 4 5	(66)
NUMBER OF STALLS, PASS-OUTS UPON SLIGHT ACCELERATION TO ROAD SPEED		(67)
ACCELERATION QUALITY	1 2 3 4 5	(68)
IDLE QUALITY AFTER 0.4 MILES FROM STOP	1 2 3 4 5	(69)

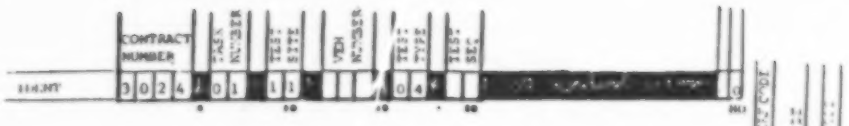
QUALITY CODE (70-71)
9=IF NOT USED, 5=EXCELLENT, 4=GOOD, 3=FAIR, 2=POOR, 1=FAIL

EMISSION COMPONENTS DATA SHEET



INDUCTION SYSTEM	
a) HEATED AIR DOOR ASSEMBLY	
b) TEMPERATURE SENSORS	
c) AIR FILTER ELEMENT	
d) HOSES	
e) OTHER	
CARBURETOR AND FUEL SYSTEM - FUEL SUBSYSTEM	
a) CARBURETOR ASSEMBLY	
b) IDLE MIXTURE ADJUSTMENT LIMITING DEVICE	
c) IDLE MIXTURE	
d) IDLE SPEED	
e) IDLE SPEED SOLENOID	
f) FUEL INJECTION COMPONENTS	
g) HOSES, LINES, WIRES	
h) OTHER	

EMISSION COMPONENTS DATA SHEET

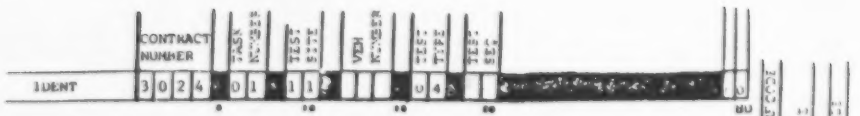


CARBURETOR AND FUEL SYSTEM - CHOKE SUBSYSTEM
a) CHOKE ADJUSTMENT (NOTCHES)
b) CHOKE ADJUSTMENT (VACUUM BREAK)
c) CHOKE ADJUSTMENT LIMITING DEVICE
d) FAST IDLE SPEED
e) VACUUM DIAPHRAGMS
f) ELECTRICAL CONTROLS
g) EXHAUST HEAT CONTROL VALVE ASSEMBLY
h) HOSES, LINES, WIRES
i) OTHER

EMISSION COMPONENTS DATA SHEET

IGNITION SYSTEM
a) DISTRIBUTOR ASSEMBLY
b) INITIAL TIMING
c) INITIAL TIMING LIMITING DEVICE
d) SPARK PLUGS AND WIRES
e) VACUUM ADVANCE ASSEMBLY
f) SPARK DELAY DEVICES
g) SPARK KNOCK DETECTOR
h) ELECTRONIC TIMING MODULE
i) COOLANT TEMPERATURE SENSORS (TVS)
j) HOSES, LINES, WIRES
k) OTHER

EMISSION COMPONENTS DATA SHEET



EGR SYSTEM

a) EGR VALVE ASSEMBLY

b) BACK PRESSURE TRANSDUCER

c) DELAY SOLENOID

d) VACUUM AMPLIFIER

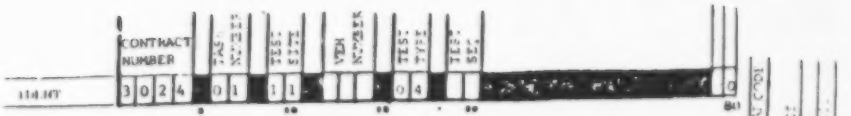
e) VACUUM RESERVOIR

f) COOLANT TEMPERATURE SENSOR (TVS)

g) HOSES, LINES, WIRES

h) OTHER

EMISSION COMPONENTS DATA SHEET



AIR INJECTION SYSTEM

a) AIR INJECTION ASSEMBLY

b) AIR BYPASS VALVE

c) AIR DIVERTER VALVE

d) CHECK VALVE

e) DRIVE BELT

f) HOSES, LINES, WIRES

g) OTHER

PCV SYSTEM

a) PCV VALVE

b) PCV FILTER

c) HOSES

d) OTHER

EMISSION COMPONENTS DATA SHEET

EXHAUST SYSTEM

a) MANIFOLD, TAILPIPE, MUFFLERS

b) CATALYST

c) OTHER

EVAPORATIVE CONTROL SYSTEM

a) CANISTER

b) CANISTER FILTER

c) CANISTER PURGE SOLENOID/VALVE

d) HOSES, LINES, WIRES

e) OTHER

ENGINE ASSEMBLY

a) ENGINE ASSEMBLY

b) COOLING SYSTEM

c) VALVE ADJUSTMENT

d) BELT TENSIONS

e) HOSES, LINES, WIRES

EMISSION COMPONENTS DATA SHEET

f) OTHER

3-WAY SYSTEM

a) ELECTRONIC CONTROL UNIT

b) OXYGEN SENSOR

c) BAROMETRIC PRESSURE SENSOR

d) LOAD SENSOR (THROTTLE POSITION, MANIFOLD VACUUM, ETC.)

e) ENGINE SPEED SENSOR

f) COOLANT TEMPERATURE SENSOR

g) CRANKSHAFT POSITION SENSOR

h) EGR POSITION SENSOR

i) EGR CONTROL SOLENOID(S)

j) AIR/FUEL CONTROL ACTUATOR (SOLENOID, STEPPER MOTOR)

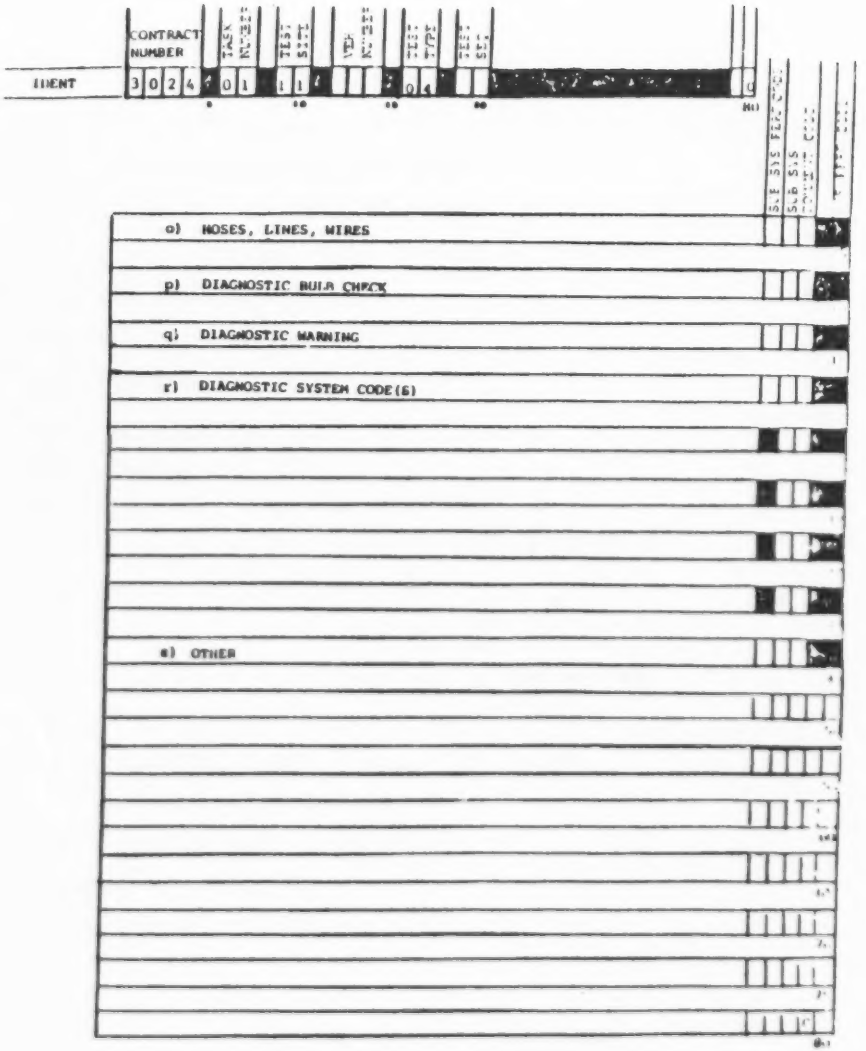
k) AIR BYPASS SOLENOID/VALVE

l) AIR DIVERTOR SOLENOID/VALVE

m) THROTTLE KICKER ACTUATOR

n) IDLE SPEED CONTROL SYSTEM

EMISSION COMPONENTS DATA SHEET



APPENDIX C

Lab Qualification Worksheets

1) Facility Inspection
2) Dynamometer Inspection
3) Driver's Aide Inspection
4) Analytical System Checks
5) Hydrocarbon Analyzer A (Low Ranges)
6) Hydrocarbon Analyzer B (High Ranges)
7) Carbon Monoxide Analyzers A (Low Ranges)
8) Carbon Monoxide Analyzers B (High Ranges)
9) Carbon Dioxide Analyzer
10) Constant Volume Sampling System Inspection
11) Oxides of Nitrogen Analyzer
12) Methane Analyzer
13) Raw Exhaust Hexane Analyzer
14) Raw Exhaust CO Analyzer
15) Raw Exhaust CO_2 Analyzer
16) Raw Exhaust NO Analyzer
17) Sealed Housing for Evaporative Determination
18) Temperature Recording - Auxiliary Devices
19) Record Keeping System Check
20) List of Documents to be Included in the Lab Qualification Packet
21) General Comments

LABORATORY QUALIFICATION WORKSHEETS

Facility Inspection	Yes/ Pass	No/ Fail	Corrected
1. Test Site San Antonio, Texas			
2. Contractor EG&G Automotive Research, Inc.			
3. Date of Inspection December 11, 1980			
4. Inspector Butch Naegelin			
5. Contractor personnel			
a. M. Dalen d. J. Rivenburgh g. C. Jackel j. L. Hernandez			
b. M. Forshee e. R. Martinez h. R. Gilmore k. S. Gearhart			
c. B. Naegelin f. B. Martinez i. C. Van Tassel			
6. Test area of adequate size?	X		
7. Soak area of adequate size? Number of vehicles 12-14	X		
8. Soak area temperature between 68°F and 86°F? 72 °F	X		
9. Distance from soak area to dynamometer 0+ ft. (same building)			
10. Soak area free of precipitation?	X		
11. Laboratory floor area? 4,547 sq. ft.			
12. Laboratory air conditioned? 73 + 5 °F	X		
a. Air conditioning capacity 56 tons	X		
13. Laboratory humidity controlled? 72 + 5 Grains (TC-2 only)		X	
14. Laboratory elevation 830 ft.			
15. Office space 723 ft^2			
16. Test Fuel			
a. Does leaded fuel meet all specs? (Attach analysis)	X		
b. Does unleaded fuel meet all specs? (Attach analysis)	X		
c. Are fuel containers clearly identified?	X		
d. Are separate systems used for leaded and unleaded fuels?	X		
e. Is the fuel dispensing system accurate within 2%?	X		
f. Storage area and temperature 55 ± 5 °F.	X		
17. Gas Cylinders			
a. Storage area of adequate size?	X		
b. Temperature of area (60°F-86°F) 65 ± 10°F		X	
c. Are cylinders secured?	X		
d. Is each cylinder equipped with a regulator? Only cylinders in-use		X	
e. Are cylinders considered empty at 100 psi?	X		
18. Lead Analysis			
a. Make and model Scientic Glass & Instruments/33060	X		
b. Work area adequate to perform analysis?	X		
c. Good laboratory techniques utilized?	X		

Comments:

Gas cylinder storage reaches low at 55°F at low ambient temperatures.

Contractor EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by Butch Naegelin Date 12/11/80

Submitted by Mark Dalen Date 12/11/30

Dynamometer Inpsection	Yes/ Pass	No/ Fail	Corrected
1. Make and model Clayton ECE-50	X		
2. Is dynamometer equipped with direct drive inertia assembly?	X		
3. Is dynamometer equipped with 125 lb. increment inertia weights?	X		
4. Is dynamometer equipped with 50 Hp power absorber unit?	X		
5. Are dynamometer rolls 8.65" dia., 78" long, and on 17.25" centers and not damaged?	X		
6. Is dynamometer calibration kit used?	X		
7. Is dynamometer horsepower calibrated in accordance with the requirements of the contract?	X		
8. Horsepower meter accurate and readable to 0.25 hp or less?	X		
9. Check speedometer-actual vs. indicated using a Strobotach. For ECE 50, 46.3 mph=1800 rpm, 45 mph = 1750 rpm, 55 mph= 2140 rpm.	X		
10. Tach. generator located on rear roll?	X		
11. Vehicle restraint cable available?	X		
12. Is dynamometer equipped to measure actual distance traveled.	X		
13. Capacity of fixed speed cooling fan should be 3300 CFM (Hartzell Model N2ADWW or equiv.) and positioned 6-12" in front of vehicle with hood open during testing?	X		

Comments:

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Driver's Aid Inspection	Yes/ Pass	No/ Fail	Corrected
1. Make and model Hewlett Packard 7133 (A)	X		
2. Check elapsed time for complete LA-4 test with accurate stop watch. (Tolerance 1.0 sec or less) Cell #1 Serial # 1060A00302	X		
a. Stopwatch time 1873.63 sec.			
b. Chart time 1874 sec.			
3. Zero and span driver's aid, check after test (± 1 mph) 1.0mph	X		
4. Zero and span driver's aid, check after test (± 1 ihp) .5ihp	X		
5. Are drivers aid strip charts within ± 1 mph and ± 1.0 sec. for all driving cycles?	X		
6. Chart width 11 in.	X		
7. Chart speed 4 $\frac{cm}{min}$ in/min	X		
8. Scale 12 $\frac{in.}{mph}$ miles/inch	X		

Comments:

#2 Drivers aid Serial # 1606A00301

Cell #2

A Stopwatch time: 1873.06

B Chart time: 1874.00

.94 sec. X

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Analytical System Checks	Yes/ Pass	No/ Fail	Corrected
1. Check for leaks in the system using daily procedure.	X		
2. Is the system plumbing either stainless steel or teflon?	X		
3. Is system leak check done before and after each test?	X		
4. Are bags purged, evacuated, and leak checked before each use?	X		
5. Are sample filters changed before each test?		N/A	
6. Are zero and span gas traces identified before and after each analysis?	X		
7. Is NO_x analyzer spanned through converter?	X		
8. Are all samples analyzed on the lowest available range?	X		
9. Are analyzer flows the same for calibration and sample analysis?	X		
10. Are samples analyzed within 20 minutes of end of test?	X		
11. Do the analyzers stay in calibration throughout the test? (± 1% FS)	X		
12. Is dilution air less than 30 ppm Carbon (less than 10 ppm C for 1975 and later model year vehicles): ≤10 ppm	X		
13. Is dilution air 10 ppm CO for 1975 and later model year tests? ≤ 5 ppm	X		
14. For 3-way catalyst vehicle testing is dilution air concentration of HC and CO less than or equal to the applicable sample?	X		
15. What are typical dilution air levels (ppm)? 9.0 Carbon 1.3 CO 3.1 CO_2 0.2 NO_x			
16. Is system purged continuously with air or nitrogen between emission tests to reduce hang-up?	X		
17. Is analytical system exhaust properly vented outside the laboratory?	X		

Comments:

Contractor EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Hydrocarbon Analyzer A (Low Range)	Yes/ Pass	No/ Fail	Corrected
1. Make and model Horiba FIA-23A with OPE-415	X		
2. Use pre-purified air for zero gas-carbon less than 1 ppm, CO less than 1 ppm, CO_2 less than 400 ppm, NO_x less than .1 ppm, Mfr. AADCO clean air generator 0.1 ppm C.	X		
3. Prepurified air used for combustion? Mfr. Liquid Carbonics	X		
4. Calibration gases cover all ranges?	X		
5. Analyzed span gas available for each range? (80% FS) min	X		
6. Check curve at three (3) points across each range. Calibration shall be within ±1% of full scale or ±5% of measured value, whichever is smaller.	X		
7. Approved peaking procedure used?		N/A	
8. Fuel pressure (H_2-N_2). 1.0 - 1.5 kg/cm^2			
9. Fuel source pressure 20 psi			
10. Air pressure 1.0 - 1.5 kg/cm^2			
11. Air source pressure 14 psi			
12. Sample pressure 6.0 psi			
13. Response time (zero gas to 90% span point) (less than 3 sec) 2 sec.	X		
14. Zero gas 5% scale return time from span point (less than 5 sec) 1.7 sec.	X		
15. Analyzer range(s) 0- 100 ,0-500 ,0-1000 ,0-5000			
16. Sample bypass flow rate 6 cfh			
17. Stability check @ zero and span point. Enter max. variation after 10 mins. (±1% FS Range 0-100 Zero 0 % FS Span .1% FS)	X		

Comments:

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Hydrocarbon Analyzer B (high ranges)	Yes/ Pass	No/ Fail	Corrected
1. Make and model Horiba FIA-23A with OPE-415	X		
2. Use prepurified air for zero gas-Carbon less than 1 ppm, CO less than 1 ppm, CO_2 less than 400 ppm, NO_x less than 1 ppm; Mfr. AADCO Clean air generator 0.1 ppm C.	X		
3. Prepurified air used for combustion? Mfr. Liquid Carbonics	X		
4. Calibration gases cover all ranges?	X		
5. Analyzed span gas available for each range? (80% FS) min.	X		
6. Check curve at three (3) points across each range. Calibration shall be within ±1% of full scale or ±5% of measured value, whichever is smaller	X		
7. Approved peaking procedure used?		N/A	
8. Fuel pressure (H_2-N_2) 1.0 - 1.5 kg/cm^2			
9. Fuel source pressure 20 psi			
10. Air pressure 1.0 - 1.5 kg/cm^2			
11. Air source pressure 14 psi			
12. Sample pressure 6.0 psi			
13. Response time (zero gas to 90% span point) (less than 3 sec) 2 sec.	X		
14. Zero gas 5% scale return time from span point (less than 5 sec) 1.7 sec.	X		
15. Analyzer range(s) 0-100 ,0-500 ,0-1000, 0-5000			
16. Sample bypass flow rate 6 cfh			
17. Stability check @ zero and span point. Enter max. variation after 10 mins. (±1% FS) Range 0-100 Zero 0 % FS Span .1 %FS	X		

Comments:

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Carbon Monoxide Analyzers A (Low Ranges)	Yes/ Pass	No/ Fail	Corrected
1. Make and model Horiba AIA-23-AS	X		
2. Flow rates bypass 5 cfh, Sample 5 cfh			
3. Check for CO_2 and H_2O interference using wet 3% CO_2 cal. gas (less than 3 ppm on 100 ppm CO range) 0 ppm	X		
4. Do calibration gases cover all ranges?	X		
5. Analyzed span gas available for each range? (80% FS)	X		
6. Use prepurified air on N_2 for zero gas. Concentration CO less than 1 ppm, CO_2 less than 400 ppm, carbon less than 1 ppm, NO_x less than 0.1 ppm. Mfr. AADCO .01 ppm.	X		
7. Check curve at seven (7) points across each range. Calibration shall be within ±1% of full scale or ±5% of measured value, whichever is smaller	X		
8. Response time (zero gas to 90% span point) (less than 5 sec) 8.74 sec.	[1] N/A		
9. Zero gas 5% scale return time from span point (less than 5 sec) 11.26 sec.	N/A		
10. Analyzer range(s) 0-100 ,0-500 ,0-1000 ,0-5000			
11. Stability checks @ zero and span point. Enter max. variation after 10 mins. (±1% FS) Range 0-100 Zero 0 % FS Span + .1% FS	X X		

Comments:

[1] The times shown reflect the response times through the entire sampling system. There is no practical method for isolating the individual analyzers to determine their response times.

Contractor EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Carbon Monoxide Analyzer B (High Ranges)	Yes/ Pass	No/ Fail	Corrected
1. Make and model See Carbon Monoxide Analyzer A	___	___	_____
2. Flow rates Bypass _____cfh, Sample _____cfh	___	___	_____
3. Check for CO_2 and H_2O interference using wet 3% CO_2 cal. gas (less than 1% FS on 3000 ppm CO range) ___ppm	___	___	_____
4. Do calibration gases cover all ranges?	___	___	_____
5. Analyzed span gas available for each range? (80% FS)	___	___	_____
6. Use prepurified air or N_2 for zero gas. Concentration CO less than 1 ppm, CO_2 less than 400 ppm, carbon less than 1 ppm, NO_x less than 0.1 ppm. Mfr. _____ _____ppm CO.	___	___	_____
7. Check curve at seven (7) points across each range. Calibration shall be within ±1% of full scale or ±5% of measured value, whichever is smaller.	___	___	_____
8. Response time (zero gas to 90% span point) (less than 5 sec.) _____sec.	___	___	_____
9. Zero gas 5% scale return time from span point (less than 5 sec.) _____sec.	___	___	_____
10. Analyzer range(s) 0-___,0-___, 0-_____			
11. Stability check @ zero and span point. Enter max. variation after 10 mins. (±1% FS) Range 0-___ Zero___% FS Span___%FS	___	___	_____

Comments:

Contractor EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Carbon Dioxide Analyzer	Yes/ Pass	No/ Fail	Corrected
1. Make and model Horiba AIA-23A	X	___	_____
2. Flow rates Bypass 6 cfh, Sample 6 cfh	X	___	_____
3. Calibration gases cover all ranges?	X	___	_____
4. Analyzed span gas available for each range? (80% FS)	X	___	_____
5. Use prepurified air or N_2 for zero gas. Concentration CO less than 1 ppm, CO_2 less than 400 ppm, carbon less than 1 ppm, NO_x less than 0.1 ppm. Mfr. Liquid Carbonic ≤ 400 ppm CO_2.	X	___	_____
6. Check curve at seven (7) points across each range. Calibration shall be within ±1% of full scale or ±5% of measured value, whichever is smaller.	X	___	_____
7. Response time (zero gas to 90% of span point) (less than 4 sec.) 7.3 sec.	[1]N/A	___	_____
8. Zero gas 5% scale return time from span point (less than 5 sec.) 9.23 sec.	N/A	___	_____
9. Analyzer range(s) 0-1.5%, C-4.0% .			
10. Stability check @ zero and span point. Enter max. variation after 10 mins. (±1% FS) (Range 0- 1.5%) Zero .1 % FS Span 0 FS	X	___	_____

Comments:

[1]The times shown reflect the response times through the entire sampling system. There is no practical method for isolating the individual analyzers to determine their response times.

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Constant Volume Sampling System Inspection

		Yes/ Pass	No/ Fail	Corrected
1.	Make and model Horiba CVS 20B			
2.	Submit all pertinent data obtained during laminar flow element calibration.			
3.	Where is the source of the CVS dilution air? Cell 1	X	___	___
4.	What is the total flow capacity of the CVS? (Min 325 cfm) 328 cfm	X	___	___
5.	What is CVS sample bag flow rate? (Min 10 cfh) 15.75cfh	X	___	___
6.	What is CVS background bag flow rate (Min 10 cfh) 15.75 cfh	X	___	___
7.	Check static pressure at mixing point of dilution air and exhaust sample. Pressure should be less than 1" H_2O below ambient when the CVS is operating at its maximum flow rate. 0.5 H_2O	X	___	___
8.	Check static pressure at the vehicle tailpipe. Pressure shall be less than +5" H_2O as referenced in 39 Federal Register 101, Section 85.075-20(b) (2). .5 H_2O	X	___	___
9.	Propane Recovery Test			
	a. Recovery shall be within +2.0% of injected volume -0.87 % -0.86 %	X	___	___
	b. Instrument grade propane used: Mfr. Liquid Carbonic	X	___	___
	c. Make and model of balance used (Accuracy within ±0.1 grams) Mettler P1210	X	___	___
	d. Is upper third of 0-500 ppm carbon range used? 90.3 def 83.4 def	X	___	___
	e. Submit all pertinent data.	X	___	___
10.	Stainless steel convoluted tubing between vehicle and CVS as short as possible?	X	___	___
11.	Are CVS sample bags made of tedlar and of sufficient size not to restrict sample flow?	X	___	___

Comments:

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Oxides of Nitrogen Analyzer

		Yes/ Pass	No/ Fail	Corrected
1.	Make and model Horiba CLA-22	X	___	___
2.	Flow rates O_2 N/A psi Internal Bypass N/A cfh External Bypass (if used) 6 cfh	X	___	___
3.	Sample pressure/reactor vacuum N/A psi N/A torr/mm	___	N/A	___
4.	Use prepurified nitrogen or air for zero gas. Concentration NO_x (less than 0.1 ppm) ≤ .1 ppm NO_x	X	___	___
5.	Calibration gases cover all ranges?	X	___	___
6.	Are NO_x cylinder regulators corrosion resistant?	X	___	___
7.	Analyzed span gas available for each range? (80% FS)	X	___	___
8.	Check curve at three (3) points across each range. Calibration shall be within ±1% of full scale or ±5% of measured value, whichever is smaller.	X	___	___
9.	Spanned through the converter?	X	___	___
10.	Response times (zero gas to 90% of span point) (5 sec max)			
	a. Through Converter 2.2 sec.	X	___	___
	b. Bypass Converter 1.8 sec.	X	___	___
11.	Zero gas 5% scale return time for span point. (must be 5 sec. or less) 4.0 sec.	X	___	___
12.	Analyzer range(s) 0- 100, 0- 300, 0- 1000, 0-			
13.	Check converter efficiency (95% ± 5%)? 98 % 1 %	X	___	___
14.	Is NO_x converter efficiency detector used?	X	___	___
15.	Is converter efficiency check performed daily?	X	___	___
16.	Stability Check @ zero and span point. Enter max. variation after 10 minutes - (±1% FS) Range 0- 100 Zero .1 % FS Span .1 %FS	X	___	___

Comments:

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Methane Analyzer	Yes/ Pass	No/ Fail	Corrected
1. Make and model _____	___	___	_____
2. Use prepurified air for zero gas - Carbon less than 1 ppm, CO less than 1 ppm, CO_2 less than 400 ppm, NO_x less than 0.1 ppm. Mfg. _____ ___ppm	___	___	_____
3. Prepurified air used for combustion? Mfg. _____	___	___	_____
4. Calibration gases cover all ranges?	___	___	_____
5. Analyzed span gas available for each range? (80% FS)	___	___	_____
6. Check curve at three (3) points across each range. Calibration shall be within ±1% of full scale or ±5% of measured value, whichever is smaller.	___	___	_____
7. Approved peaking procedure used:	___	___	_____
8. Fuel Pressure (H_2-H_e) _____psi			
9. Fuel source pressure _____psi			
10. Air pressure _____psi			
11. Air source pressure _____psi			
12. Sample pressure _____psi			
13. Analyzer range 0-____,0-____,0-_____			
14. Method of reading output of analyzer _____			

Comments:

N/A

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Raw Exhaust Hexane Analyzer	Yes/ Pass	No/ Fail	Corrected
1. Make and model Horiba Mexa 321E	X	___	_____
2. Flow rates Sample 6 cfh			
3. Calibration gases cover all ranges?	X	___	_____
4. Analyzed span gas available for each range? (80% FS)	X	___	_____
5. Use prepurified nitrogen or air for zero gas 0.1 ppm C	X	___	_____
6. Check curve at 6 points across each range. Calibration shall be within ±2% of full scale or ±10% of measured value, whichever is smaller.	X	___	_____
7. Response time (zero gas to 90% of span point) (less than 5 sec) 3 sec.	X	___	_____
8. Zero gas 5% scale return time from span point (less than 5 sec). 2 sec.	X	___	_____
9. Analyzer range(s) 0- 500, 0- 2000			

Comments:

N/A

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Raw Exhaust CO Analyzer	Yes/ Pass	No/ Fail	Corrected
1. Make and model Horiba AIA-23-A	X		
2. Flow rates sample 5 cfh	X		
3. Check for CO_2 and H_2O interference using wet 8% CO_2 cal. gas (less than 1% FS on .5% CO range) 0 ppm % FS	X		
4. Calibration gases cover all ranges?	X		
5. Analyzed span gas available for each range? (80% FS)	X		
6. Use prepurified air or N_2 for zero gas (Concentration CO less than 1 ppm) Mfr. AADCO < .1 ppm	X		
7. Check curve at 7 points across each range. Calibration shall be within ±2% of full scale or ±10% of measured value, whichever is smaller.	X		
8. Response time (zero gas to 90% span point) (less than 5 sec.) 6.2 sec.	[1]N/A		
9. Zero gas 5% scale return time from span point (less than 5 sec.) 6.9 sec.	[1]N/A		
10. Analyzer range(s) 0- 2.0%, 0- 10.0%			

Comments:

[1]The times shown reflect the response times through the entire sampling system. There is no practical method for isolating the individual analyzers to determine their response times.

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Raw Exhaust CO_2 Analyzer	Yes/ Pass	No/ Fail	Corrected
1. Make and model Horiba AIA-23A	X		
2. Flow rates Sample 5 cfh	X		
3. Calibration gases cover all ranges?	X		
4. Analyzed span gas available for each range?	X		
5. Use prepurified nitrogen or air for zero gas .1 ppm CO_2.	X		
6. Check curve at 7 points across each range. Calibration shall be within ±2% of full scale or ±10% of measured value, whichever is smaller.	X		
7. Response time (zero gas to 90% of span point) (less than 5 sec.) 5.7 sec.	[1]N/A		
8. Zero gas 5% scale return time from span point (less than 5 sec.) 5.9 sec.	[1]N/A		
9. Analyzer range(s) 0 -7.0% , 0 - 15.0%			

Comments:

[1]The times shown reflect the response times through the entire sampling system. There is no practical method for isolating the individual analyzers to determine their response times.

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Raw Exhaust NO Analyzer	Yes/ Pass	No/ Fail	Corrected
1. Make and model ___Same as NO_x Analyzer___	___	___	_____
2. Flow rates O_2 ___psi Internal Bypass ___chf External bypass (if used) ___cfh			
3. Sample pressure/reactor vacuum ___psi / ___ torr/mm			
4. Calibration gases cover all ranges?	___	___	_____
5. Analyzed span gas available? (80% FS)	___	___	_____
6 Use prepurified nitrogen or air for zero gas. (NO_x concentration less than 0.1 ppm) ___ppm NO_x	___	___	_____
7. Check curve at ___ points across each range. Calibration shall be within +2% of full scale or ±10% of measured value, whichever is smaller.	___	___	_____
8. Response time (zero gas to 90% of span point) (10 sec. max.)	___	___	_____
9. Zero gas 5% scale return time from span point. (10 sec. max.) ___sec.	___	___	_____
10. Analyzer range(s) 0-___,0- ___,0- ___ 0, ___			

Comments:

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Sealed Housing for Evaporative Determination	Yes/ Pass	No/ Fail	Corrected
1. Hydrocarbon analyzer			
a. Make and model _____	___	___	_____
b. Use prepurified air for zero gas - Carbon less than 1 ppm, CO less than 1 ppm, CO_2 less than 400 ppm, NO_x less than .1 ppm. Mfr. _____ _____ppm C.	___	___	_____
c. Prepurified air used for combustion? Mfr. _____	___	___	_____
d. Calibration gases cover all ranges?	___	___	_____
e. Analyzed span gas available for each range? (80% FS)	___	___	_____
f. Check curve at three (3) points across each range. Calibration shall be within ±1% of full scale or ±5% of measured value, whichever is smaller.	___	___	_____
g. Approved peaking procedure used?	___	___	_____
h. Fuel pressure (H_2-He) _____psi			
i. Fuel source pressure _____psi			
j. Air pressure _____psi			
k. Air source pressure _____psi			
l. Sample pressure _____psi			
m. Response time (zero gas to 90% span point)(less than 1.5 sec.) _____sec.	___	___	_____
n. Zero gas 5% scale return time from span point (less than 5 sec) _____sec.	___	___	_____
o. Analyzer range(s) 0-____, 0-____, 0-___			
p. Sample bypass flow rate _____cfh			
2. Test Fuel			
a. Does fuel meet specifications?	___	___	_____
b. Was sample of fuel analyzed by other than manufacturer? (attach analysis)	___	___	_____
c. Refrigerated fuel handling system adequate?	___	___	_____

Sealed Housing for Evaporative Determination (Cont'd)	Yes/ Pass	No/ Fail	Corrected
3. Enclosure Calibration			
a. Background emissions (.4 gms/4 hrs. max.) _____	___	___	_____
b. Verify enclosure calibration (±2% of injected value) _____%	___	___	_____
i. Enclosure volume (from calibration) _____ m^3			
c. Enclosure retention check (less than 4% leak rate in 4 hours) _____%	___	___	_____
4. Temperature Recorders			
a. Capable of resolving time to 15 sec?	___	___	_____
b. Capable of resolving temp. to ±.75°F (.42°C)?	___	___	_____
c. Temp. accuracy of ±2°F (1.1°C)?	___	___	_____
d. Time accuracy over one (1) hour period (±15 sec max.) _____sec.	___	___	_____
e. Temp. sensor correctly located (3 ± .5 Ft. from floor, approx. 4 inches from wall, approx. at vertical centerline of wall)?	___	___	_____
5. Purge blower adequate?	___	___	_____
6. Internal mixing blowers adequate?	___	___	_____
7. Evaporative systems pressure check equipment.			
a. Able to measure fifteen (15) inches of H_2O pressure?	___	___	_____
b. Capable of resolving pressure to ± 1.0 in. H_2O?	___	___	_____
8. Enclosure cooling system.			
a. Cooling surfaces monitored to maintain temp. between 68°F (20°C) and 86°F (30°C)?	___	___	_____

Comments:

N/A

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Temperature Recording - Auxiliary Devices	Yes/ Pass	No/ Fail	Corrected
1. Device used to continually measure wet and dry bulb temperatures during tests.			
a. Make and model Thermocouples	X	___	_____
b. Recorder make and model Easterline Anges MS 42-B Range 0 - 50-100°F.	X	___	_____
2. Soak area temperature continuously monitored and recorded on a strip chart?			
Distance from Vehicles max. 15 ft			
Range 0 to 100 °F			
Chart Speed 0.5 in/hr			
Chart Width 11 inches			
90% Step Change in less than 10 sec? 4 sec.	X	___	_____

Comments:

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Record Keeping System Check	Yes/ Pass	No/ Fail	Corrected
1. Complete analytical system check made weekly?	X		
2. Dynamometer calibration check made bi-weekly?	X		
3. HC hang-up check using zero grade air results recorded daily? [1] Sample bag and line 0.5 ppm/C (less than 1 ppm C)	X		
4. Are prepurified air and N_2 checks suitably recorded? A copy of manufacturer's analysis is required for each cylinder.	X		
5. HC, CO, CO_2, NO_x analytical system leak check performed and recorded daily?	X		
6. CVS calibration check using propane injection on 0-300C range done daily before testing begins?	X		
7. CVS sample and background bags purged, leak checked before each test and results recorded daily?	X		
8. Check log of daily, weekly, bi-weekly, monthly calibrations and checks. Does each entry contain date, results, and signatures?	X		
9. Check maintenance log for all laboratory equipment?	X		
10. Check for proper test fuel as required by Federal Register and/or contract.	X		
11. Daily log of instrument settings.	X		
12. Master log of all tests performed.	X		
13. Proper storage for all instruments and driver's trace and temperature recorder charts?	X		
14. Check master log of gas cylinders (including lab standards and span gases) to insure record of dates, cylinder numbers, pressures, types of gases, concentrations, and ranges of use?	X		

	Yes/ Pass	No/ Fail	Corrected
15. Check information on test data sheets			
a. Test lab location, date and time of test.	X		
b. Type of test (CVS, etc.)	X		
c. Personnel involved.	X		
d. Vehicle data - make, model, year, transmission type, odometer, engine family, carb. information, displacement, cylinders, type of emission controls, fuel tank capacity, inertia loading, actual road load HP @ 50 mph, indicated HP setting @ 50 mph, tire pressure, air conditioning.	X		
e. Test conditions - Are barometric pressure and ambient temperature (dry bulb and wet bulb) in front of vehicle recorded continuously on strip charts during the tests (dry bulb tolerances $68^{o}F$ - $86^{o}F$).	X		
f. Temperature and pressure of the exhaust and dilution air mixture entering the positive displacement pump. Temperature of the mixture shall be recorded continuously during the test. Set point ___^{o}F max. Variation during test ___^{o}F.	N/A		
16. Do records include vehicle inspection parameters such as idle rpm, spark advance, idle mixture, exhaust HC, CO, etc?	X		
17. Check for records of all pertinent information on recorder charts, such as: location, car and run no., date, time, person in charge; identify zero and span gas traces before and after test, gas analyzed and range(s) used?	X		

Comments:

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

Documents to be Included as Part of This Package	Yes/ Pass	No/ Fail	Corrected
1. Latest copy of all analyzer curves.	X		
2. Copy of certified calibration for the laminar flow element in the CVS calibration.	X		
3. Latest copy of the dynamometer curves.	X		
4. Copy of daily, weekly, monthly logs.	X		
5. Copy of preventive maintenance and calibration schedule for laboratory equipment other than dyno, CVS and analytical systems.	*		
6. Copy of fuel analysis.	X		
7. Copy of analysis of zero air and/or nitrogen cylinders.	N/A		
8. Copy of calibrations of flow meters.	X		
9. Copy of calibrations of temperature recorders.	X		

Comments:

*Preventive maintenance and calibrations are perofmred on a monthly basis or sooner if deemed necessary by the lab supervisor or lab technician.

General Comments:

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin Date 12/11/80

Submitted by: Mark Dalen Date 12/11/80

I have received all the data contained in this report and have discussed its contents with the EPA inspector.

Signature

Date

APPENDIX D

Calibration Forms

1) Daily Work Summary Log
2) Daily Equipment Check Sheet
3) Span Gas Information
4) Weekly Analyzer Calibration Curve Sheet
5) Monthly Analyzer Calibration Curve Sheet
6) Weekly CO_2/H_2O Interference Check
7) Zero Compensation Adjustment for CO_2 Interference
8) Daily NOx Converter Efficiency Test
9) Weekly Chassis Dyno Calibration Verification Data Sheet
10) Monthly Dynamometer Calibration Data Sheet
11) Daily CFV Propane Verification
12) CVS-CFV Flow Calculation Check
13) CVS-CFV Flow Computer Calibration Data Sheet
14) Monthly Temperature Recorder Calibration and Functional Check
15) Dynamometer/RLPC Calibration Check List
16) CVS-CFV Calibration Data Sheet

Data Form NO. 13

DAILY WORK SUMMARY LOG

Date:_____ Shift:_____

ENTER TIME OF COMPLETION AND INITIALS IN EACH ACTIVITY SPACE

PERFORM DAILY

Analytical Bench Start Up:_____

Equipment Checks:_____

NO_x Converter Efficiency:_____

Propane Injection Verification:_____

Span/Gas/Pressure Log:_____

Maintenance Performed:_____

Dynamometer Warm Up: Dyno #1_____

Dyno #2_____

PERFORM WEEKLY

Chassis Dyno Verification: Dyno #1_____ Dyno #2_____

Analyzer Calibrations:_____

PERFORMED PERIODICALLY

Chassis Dyno Calibration: Dyno #1_____ Dyno #2_____

CVS Flow Calibration:_____

Test Number	Vehicle Number	Vehicle Make & Model	Received	Maintenance	Preconditioning	FTP	Data Reduction	Data Validation	FTP Sequence & Result (Good/Abort)
					Dyno #	Dyno #			
					Dyno #	Dyno #			
					Dyno #	Dyno #			
					Dyno #	Dyno #			
					Dyno #	Dyno #			
					Dyno #	Dyno #			
					Dyno #	Dyno #			
					Dyno #	Dyno #			

Technician's Signature:_____

Quality Control Signature:_____

SUBSCRIBED AND SWORN TO BEFORE ME
THIS _____ DAY OF _____, 19

_____
NOTARY PUBLIC

MY COMMISSION EXPIRES:_____

DAILY EQUIPMENT CHECK SHEET

Date	CO Functional Check 0-100 PPM (R1-1)					CO_2 Functional Check 0-1.5% (R1-1)					HC Functional Check 0-100 PPM (R-1-1)					NO_x Functional Check 0-100 PPM (R1-1)				
	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise

Date	CO Functional Check 0-500 PPM (R1-2)					CO_2 Functional Check 0-4% (R1-2)					HC Functional Check 0-500 PPM (R1-2)					NO_x Functional Check 0-100 PPM (R1-2)				
	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise

Date	Filter Checks				System Leak Checks							NO_x Conv. Eff.	Propane Verification % Error	HC Hang-up In Deflection Units				Ambient Data	
	F3	F1	F2	F3	Anal. System	B1	B2	B3	B4	B5	B6			Sample Line	Bag 4	Bag 5	Bag 6	CO	HC

DAILY EQUIPMENT CHECK SHEET

Date	CO Functional Check 0-1000 PPM (R1-3)					CO Functional Check 0-2.0% (R1-5)					CO_2 Functional Check 0-7.0% (R1-3)					HC Functional Check 0-1000 PPM (R1-3)				
	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise

Date	CO Functional Check 0-5000 PPM (R1-4)					CO Functional Check 0-10% (R1-6)					CO_2 Functional Check 0-15% (R1-4)					HC Functional Check 0-5000 PPM (R1-4)				
	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise

Date	NO_x Functional Check 0-30 PPM (R1-0)					NO_x Functional Check 0-1000 PPM (R1-3)					HC Functional Check 0- 500 PPM HEX 500					HC FUNCTIONAL CHECK 0 - 2000 PPM HEX 2000				
	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise

DATA FORM NO. _____

Page _____ of _____

SPAN GAS INFORMATION

Component	Range Code	Full Conc.	Span Gas Concentration	Span Point Deflections	Effective Date	Effective Run Numbers
CO	11	100 ppm				
	12	500 ppm				
	13	1,000 ppm				
	14	5,000 ppm				
	15	2.0%				
	16	10.0%				
CO_2	11	1.5%				
	12	4.0%				
	13	7.0%				
	14	15.0%				
O_2	13	25.0%				
HC TOTAL CARBON HEXANE	11	100 ppm				
	12	500 ppm				
	13	1,000 ppm				
	14	5,000 ppm				
	N/A	500 ppm				
HEXANE	N/A	2,000 ppm				
NO_x	10	30 ppm				
	11	100 ppm				
	12	300 ppm				
	13	1,000 ppm				

Date: _____ Technician: _____ Quality Audit: _____

Date: _____ Technician: _____ Quality Audit: _____

Date: _____ Technician: _____ Quality Audit: _____

Date: _____ Technician: _____ Quality Audit: _____

Date: _____ Technician: _____ Quality Audit: _____

Date: _____ Technician: _____ Quality Audit: _____

Date: _____ Technician: _____ Quality Audit: _____

DATA FORM NO. _____

Supplemental Page

SPAN GAS INFORMATION

Component	Range Code	Full Conc.	Span Gas Concentration	Span Point Deflections	Effective Date	Effective Run Numbers
CO	11	100 ppm				
	12	500 ppm				
	13	1,000 ppm				
	14	5,000 ppm				
	15	2.0%				
	16	10.0%				
CO_2	11	1.5%				
	12	4.0%				
	13	7.0%				
	14	15.0%				
O_2	13	25.0%				
HC TOTAL CARBON HEXANE	11	100 ppm				
	12	500 ppm				
	13	1,000 ppm				
	14	5,000 ppm				
	N/A	500 ppm				
HEXANE	N/A	2,000 ppm				
NO_x	10	30 ppm				
	11	100 ppm				
	12	300 ppm				
	13	1,000 ppm				

Prepared By: _____ Date _____

Quality Audit: _____ Date _____

WEEKLY ANALYZER CALIBRATION CURVE SHEET

Gas Analyzed:_____ Range:_____

Analyzer Make/Model:_____ Cell Length:_____

Serial Number:_____ Recorder:_____

Zero Setting:_____ Gain:_____ Time at Start:_____ am/pm

Nominal Meter (%)	Nominal Concentrat (PPM)	Cylinder Serial Number	Cylinder Pressure (To Reg)	Cylinder Pressure (Out Reg)	Analyzer Outlet Flow (SCFH)	Cylinder Concentrat. (PPM)	Meter Deflect.	Lower Limit on Deflect.	Upper Limit on Deflect.
0	0								
90									
75									
60									
45									
30									
15									
Span 90									

Operator's Signature:_____ Completion Time:_____ am/pm Date:_____

Quality Control Signature:_____

VW Observer:_____

MONTHLY ANALYZER CALIBRATION CURVE SHEET

Gas Analyzed:_____ Range:_____

Analyzer Make/Model:_____ Cell Length:_____

Serial Number:_____ Recorder:_____

Zero Setting:_____ Gain:_____ Time At Start:_____ am/

Nominal Meter (%)	Nominal Concentrat. (PPM)	Cylinder Serial Number	Cylinder Pressure (To Reg)	Cylinder Pressure (Out Reg)	Analyzer Outlet Flow (SCFH)	Cylinder Concentrat. (PPM)	Meter Deflectio
0	0						
90							
75							
60							
45							
30							
15							
Span 90							

Operator's Signature:_____ Completion Time:_____ am/pm Date:_____

Quality Control Signature:_____

Observer:_____

WEEKLY CO_2/H2O INTERFERENCE CHECK

DATE:_____ TIME:_____

ANALYZER MODEL:_____ SERIAL NO:466920/24

1. ZERO LCO ANALYZER RANGE 1 (LCO_2 ANALYZER MUST BE ON RANGE 2)

2. SET RECORDER PEN ON THE 10.0 LINE OF CHART PAPER AND USE THIS AS ZERO SET POINT.

3. INTRODUCE INTERFERENCE GAS. BUTTON SELECTION:
   LCO = Master
   LCO_2 = SPAN
   MASTER = Idle
   INTF CHK = in

4. _____ WET CO_2 DEFLECTION (Bubbles should be seen in Bubbler)

5. ZERO LCO ANALYZER. WET CO_2 DEFLECTION MUST BE LESS THAN 3.0 PPM.
   BUTTON SELECTION FOR ZERO:
   LCO = Zero
   LCO_2 = Zero
   MASTER = Idle
   INTF CHK = out

OPERATORS SIGNATURE _____

QUALITY CONTROL SIGNATURE _____

ZERO COMPENSATION ADJUSTMENT FOR CO_2 INTERFERENCE

NOTE: IF ANY ADJUSTMENT ARE REQUIRED, ALL STEPS MUST BE DONE

AFTER COMPLETION OF ADJUSTMENTS A MONTHLY ANALYZER CALIBRATION MUST BE DONE ON ALL RANGES.

1. LCO ANALYZER TO RANGE 1

2. LCO_2 ANALYZER TO RANGE 2

3. DVM SELECTOR TO LCO

4. CONNECT A VOLTMETER BETWEEN TP2 AND E (COM) ON MOTHERBOARD 2E

5. ZERO AND SPAN LCO ANALYZER AND RETURN TO ZERO. (DO NOT TOUCH SPAN KNOB AGAIN AFTER ANALYZER IS SPANNED)

6. INTRODUCE INTERFERENCE GAS. BUTTON SELECTION:
   LCO = MASTER
   LCO_2 = SPAN
   MASTER = IDLE
   INTF CHK = in

7. ON MOTHERBOARD 2E, ADJUST THE CS 1 POTENTIOMETER FOR A 0.000 ± 1mv INDICATION ON THE VOLTMETER

8. INTRODUCE ZERO GAS AND CHECK ANALYZER FOR ZERO READING. BUTTON SELECTION:
   LCO = ZERO
   LCO_2 = ZERO
   MASTER = IDLE
   INTF CHK = out

9. REPEAT STEPS #6 - 8. IF NO ADJUSTMENTS ARE REQURIED CONTINUE TO STEP # 10

10. LCO ANALYZER TO RANGE 3. CHECK ZERO. IF ZERO IS NOT CORRECT, ADJUST MZ 3 POTENTIOMETER ON MOTHERBOARD 2E UNTIL VOLTMETER INDICATES 0.000 ± 1mv.

11. INTRODUCE INTERFERENCE GAS. (BUTTON SELECTION IS SAME AS STEP #6)

12. ADJUST THE CG 3 POTENTIOMETER ON MOTHERBOARD 2E FOR A 0.000 ± 1mv INDICATION ON THE VOLTMETER.

13. INTRODUCE ZERO GAS AND CHECK ANALYZER FOR ZERO READING. (BUTTON SELECTION IS THE SAME AS STEP #8)

14. REPEAT STEPS #10 - 13. IF NO FURTHER ADJUSTMETS ARE REQUIRED, THIS COMPLETES INTERFERENCE ZERO COMPENSATION ADJUSTMENTS. THE ANALYZER REQUIRES A MONTHLY CALIBRATION ON ALL RANGES.

DATE_____ ANALYZER MODEL AIA 23 SERIAL NO 466920/24

WERE THE FOLLOWING POTENTIOMETERS ADJUSTED?

MZ 1 YES NO
CS 1 YES NO
MZ 3 YES NO
CG 3 YES NO

OPERATORS SIGNATURE_____

Data Form 19

DAILY NO_X CONVERTER EFFICIENCY TEST
(HORIBA NO_X GENERATOR MODEL #210)

DATE OF TEST:_____ TIME:_____

OPERATOR _____ ANALYZER MAKE AND MODEL _____

(NO) CYLINDER # _____ CONCENTRATION _____ PPM VENDOR _____

AIR CYLINDER # _____ VENDOR _____ POT SET_____

BAROMETRIC PRESSURE_____" HG BAROMETER TEMPERATURE _____^{o}F

1. PRESS NO_X GEN. BUTTON ON CONTROL PANEL IN.
2. VERIFY THAT OZONE GENERATOR IS ON
3. FLOW CONTROL VALVES ON DRY AIR, OZONE BYPASS, AND NITRIC OXIDE ARE OFF
4. POWER SWITCH "OFF" AND OZONE AND AIR SHUT OFF VALVE "CLOSED"
5. ADJUST NITRIC OXIDE FLOW CONTROL VALVE FOR 6 TO 10 SCFH
6. NO_X ANALYZER TO "NO" MODE, AND SPAN TO 80.0. RECORD THIS ON CHART. _____
7. POWER SWITCH TO "ON".
8. OPEN OZONE & AIR SHUTOFF VALVE AND ADJUST OZONE BYPASS FLOW CONTROL VALVE TO 1 SCFH
9. ADJUST OZONE FLOW NEEDLE VALVE UNTIL THE NO_X ANALYZER INDICATES APPROX. 16.0 RECORD READING _____
10. POWER SWITCH TO "OFF". NOTE: DVM MUST RETURN TO 75.0 OR HIGHER. IF IT DOES NOT, REPEAT STEPS 6-9 WITH OZONE BYPASS FLOW SET AT A LOWER RATE. (LESS THAN 1.0 SCFH)
11. ADJUST FLOW CONTROL ON DRY AIR FLOWMETER FOR A READING OF 72.0 ± 1.0 RECORD READING _____
12. POWER SWITCH TO "ON".
13. READJUST OZONE FLOW NEEDLE VALVE FOR A READING OF 14.4 ± 1.0 RECORD READING_____
14. POWER SWITCH TO "OFF".
15. VERIFY THAT THE READING IS STILL APPROX. 72.0 RECORD READING _____
16. POWER SWITCH TO "ON" & RECORD READING _____
17. NO_X ANALYZER TO "NO_X" MODE ALLOW TO STABILIZE AND RECORD READING _____
18. POWER SWITCH TO "OFF" AND ALLOW TO STABILIZE AND RECORD READING _____
19. CLOSE OZONE AND AIR SHUTOFF VALVE AND RECORD STABLE READING_____
    NOTE THIS READING WILL NOT BE MORE THAN 4.0 OF STEP #6

DAILY NOX CONVERTER EFFICIENCY TEST
(HORIBA NO_X GENERATOR MODEL #210)

20. NO_X ANALYZER TO ZERO.
21. PRESS NO_X GEN. BUTTON ON CONTROL PANEL TO RELEASE BUTTON TO THE OUT " OFF" POSITION.
22. PERFORM THE FOLLOWING CALCULATION FOR PERCENT CONVERSION:

    (1+(a-b)/(c-d))* 100 NOTE: This is how it is entered in the H/P Calculator.

    a = step # 17
    b = step # 18
    c = step # 15
    d = step # 16

    Percent efficiency = _____ (must be over 90%)

    OPERATOR'S SIGNATURE _____

    QUALITY CONTROL SIGNATURE _____

Data Form No. 20

MONTHLY
DYNAMOMETER CALIBRATION DATA SHEET

Date: _____ Dyno I.D.: _____

Time: _____ am/pm Technician: _____

Comments from Electrical Adjustments: _____

_____

Inertia Weight (LBS)	Indicated H.P.	Time (Seconds) Run 1	Run 2	Run 3	Average	K	Actual RHP

Actual RHP = $\frac{K}{\text{Average Time}}$

Technician's Signature: _____ Time: _____ am/pm Date: _____

Quality Control Signature: _____

Data Form No. [illegible]
Revised A[illegible]

Page 1 of 1

WEEKLY CHASSIS DYNO CALIBRATION
VERIFICATION DATA SHEET

DATE: _____ DYNO I.D. NO. _____ _____

TIME: _____ AM - PM TECHNICIAN: _____

DATE OF LAST ELECTRONIC CALIBRATION: _____

DATE OF LAST MECHANICAL CALIBRATION: _____

Inertia Wt. (lbs)	T.W.	F.R. I.H.P.	R.R. I.H.P.	Time (Seconds) Run 1	Run 2	Run 3	Average	Calculated Time	Diff. (sec)

	Front Roll	Rear Roll	Must Be	F.R. \ Diff. / R.R.
Speed at 1800 R.P.M.			46.3 ± .2	

This coastdown is to be used for Car( ) # ⟶	
Actual Horsepower = K Factor =	

Technician's Signature: _____

Quality Control Signature: _____

EG&G AUTOMOTIVE RESEARCH

Data Form 21

DAILY C. F. V. PROPANE VERIFICATION

OPERATOR:_____ DATE:_____

BAROMETER TEMP._____ °F BAROMETRIC PRESSURE_____" HG

BOTTLE WEIGHT BEFORE_____

BOTTLE WEIGHT AFTER_____

Vmix (SCF) _____

EXHAUST BAG #_____
HC RANGE _____ METER DEFLECTIONS_____ CONC._____PPM

BACKGROUND BAG #_____
HC RANGE _____ METER DEFLECTIONS _____ CONC._____PPM

OPERATOR'S SIGNATURE _____ TIME:_____

QUALITY CONTROL SIGNATURE _____

DATA FORM NO. 302
(Rev. 3 [illegible])
Page [illegible]

CVS-CFV FLOW CALCULATION CHECK

_____

DATE_____ TIME _____ AM / PM TECHNICIAN _____

CVS MASS CALCULATION TAPE, PROGRAM #5

	T_A (°F) AMBIENT TEMP	B(IN. Hg) BARO PRESS	B_T (°C) BARO TEMP	TIME SECONDS	ΔP (IN. H_2O)	INDICATED VOLUME	CALCULATED VOLUME	DIFFERENCE
TEST 1								
TEST 2								
TEST 3								
AVERAGE								

TECHNICIAN'S SIGNATURE _____ TIME _____ AM / PM

DATE _____

Q. C. ENGINEER'S
SIGNATURE _____ TIME _____ AM / PM

DATE _____

Data Form No. 25

CVS-CFV FLOW COMPUTER CALIBRATION DATA SHEET Sheet 1 of 1

CVS NUMBER _____

DATE _____ TIME _____ AM/PM TECHNICIAN _____

NOTE: USE CVS MASS CALCULATION TAPE, PROGRAM #5

Counter For Phase	Pot Turns Before This Phase	Obs. Baro. Pressure (In. Hg)	Baro Temp (°C)	Ambient Temp (°F)	Elapsed Time (Seconds)	ΔP Venturi Inlet Dep (In. H_2O)	Counter Ind. Vol. ($Ft.^3$)	Calc. Vol. ($Ft.^3$)	Counter Error ($Ft.^3$)
		Avg.	Avg.	Avg.					
		Avg.	Avg.	Avg.					
		Avg.	Avg.	Avg.					
Average									

CVS NUMBER _____

Sheet 2 of 2

Counter For Phase	Pot Turns Before This Phase	Obs Baro. Pressure (In. Hg)	Baro Temp (°C)	Ambient Temp (°F)	Elapsed Time (Seconds)	Δ P Venturi Inlet Dep (In. H_2O)	Counter Ind. Vol (Ft^3)	Calc vol (Ft^3)	(Ft^3)
		Avg.	Avg.	Avg.					
		Avg.	Avg.	Avg.					
		Avg.	Avg.	Avg.					
Average									

Applicable Specifications:

Elapsed Time (Seconds)	Maximum Allowed Error For Single Counter ($Ft.^3$)	Maximum Allowed Average Error For The Three Counters ($Ft.^3$)	Maximum Allowed Difference Between Any Two of the Three Counter Errors ($Ft.^3$)
500	10.00	6.00	8.00
1000	15.00	9.00	10.00

TECHNICIAN'S SIGNATURE _____ DATE _____

TIME _____ AM / PM

THIS DATA HAS BEEN REVIEWED AND APPROVED BY EG&G ARP QUALITY CONTROL DEPARTMENT:

_____ DATE _____

87

MONTHLY

TEMPERATURE [illegible]

CALIBRATION AND FUNCTIONAL CHECK

ITEMS REQUIRED: Thermocouples

Three beakers, each of which has a capacity of at least [illegible]

Ice (needed only if 50° water cannot be obtained from tap)

Precision thermometer having NBS traceability

Instrument repair tool kit

Implement for stirring water baths

CALIBRATION AND FUNCTIONAL CHECK:

1. Use the pertinent sections of the instrument manual to make any mechanical adjustments which are deemed necessary after observing the recorder in operation.
2. Allow the recorder and its servo-mechanism to warm up for at least 10 minutes.
3. Using the beakers, tap water and the precision thermometer, make three water baths having different temperatures, as follows:

   Cool Water Bath - 50° to 60°F

   Room Temperature Water Bath - 70° to 80°F

   Warm Water Bath - 85° to 88°F

   When this is complete, check each thermocouple and its associated recorder channel against the precision thermometer in each water bath in the following sequence:

   Room Temperature Water Bath
   Cool Water Bath

   Room Temperature Water Bath
   Warm Water Bath

   Room Temperature Water Bath

   When performing these checks, the water bath in use should be stirred constantly and readings should be taken only after both the thermometer and the recorder readings have been stabilized. When changing water baths, visually observe the transient response of the recorder to see whether or not overshoot occurs and to see whether or not the overshoot is less than two percent (2%) of full scale.

   Usually, no overshoot will occur and a rough estimate of the instrument deadband can be obtained from the difference between the first and second and the second and third readings of the room temperature water bath. Deadband, as indicated by the above mentioned differences, should not exceed ±0.2% of full scale. If the indicated deadband does exceed ±0.2% of full scale, the readings discussed above should be taken again to ensure that the high indicated deadband was not a result of temperature changes in the room temperature water bath.

   The temperature readings on the recorder should agree with the corrected thermometer readings within ±1°F. If only one of the thermocouples shows a response which is out

RESULTS OF CALIBRATION AND FUNCTIONAL CHECK

MECHANICAL ADJUSTMENTS PERFORMED: _____

ELECTRICAL ADJUSTMENTS PERFORMED: _____

WATER BATH	THERMOMETER INDICATED TEMPERATURE						RECORDER INDICATED TEMPERATURE						CORRECTED THERMOMETER READING					
	CHANNEL						CHANNEL						CHANNEL					
[illegible] TEMPERATURE																		
[illegible]																		
[illegible] TEMPERATURE																		
[illegible]																		
[illegible] TEMPERATURE																		

	THERMOCOUPLE CHANNEL						THERMOCOUPLE CHANNEL					
OVERSHOOT (% OF FULL SCALE)												
DEADBAND (% OF FULL SCALE)												

Temperature Recorder
Calibration and Functional Check
Page 2

of the ±1°F tolerance, that thermocouple may be faulty and it should be replaced and the new one should be checked. If two or more of the thermocouples show a response outside the ±1°F tolerance, the recorder gain and zero potentiometers may need adjustment. Before adjusting the gain or zero potentiometers, each thermocouple should be rechecked against the thermometer in each water bath to ensure that an out-of-tolerance condition indeed exists.

RESULTS OF CALIBRATION AND FUNCTIONAL CHECK:

1. Mechanical Adjustments Performed: _____

2. Electrical Adjustments Performed: _____

APPLICATION SPECIFICATIONS (MIN OR): Accuracy to within ±1.0°F

OTHER SPECIFICATIONS: Overshoot ≤2% of full scale
Deadband ≤0.2% of full scale

CALIBRATION AND FUNCTIONAL CHECK PERFORMED BY: _____

DATE: _____ TIME: _____ am/pm

Witnessed by: _____

SUBSCRIBED TO AND SWORN TO BEFORE ME
THIS _____ DAY OF _____, 197

_____
NOTARY PUBLIC

MY COMMISSION EXPIRES: _____

DYNAMOMETER/RLPC CALIBRATION CHECK LIST

* (Dyno # ONLY, Serial #A-32206-3-578)

DYNAMOMETER NUMBER:_____ SERIAL NUMBER:_____

TECHNICIAN:_____ DATE:_____

A. WARM UP:

_____ 1. Unless the dynamometer has been used within the last half hour, obtain a copy of DATA FORM 107.1 and perform a dynamometer warm up, as per the procedure on that form.

Warm up performed:_____

Warm up not necessary since dynamometer last ust at:_____ A.M./P.M.

_____ 2. Negative lead of DVM connected to ITB COMMON terminal 211:_____

B. REAR ROLL CALIBRATION: (Reference Figure 2)

_____ 1. Speed/power switch to: REAR ROLL _____

_____ 2. Positive lead of DVM to test point 2 board 8. _____

_____ 3. Adjust pot 3 board 8 to DVM reading of 0.000± .002 VDC (ROLLS STOPPED). _____

_____ 4. Adjust pot 4 board 8 to DVM reading of 4.63± .002 VDC (REAR ROLL at 1800 rpm) Time:_____ AM/PM _____

_____ 5. Recheck pot 3 board 8 reading at 0.000± .002 VDC (ROLLS STOPPED).

C. FRONT ROLL CALIBRATION: (Reference Figure 2)

_____ 1. Speed/power switch to: FRONT ROLL _____

_____ 2. Positive lead of DVM to test point 5 board 7. _____

_____ 3. Adjust pot 6 board 7 to DVM reading of 0.000± .002 VDC (ROLLS STOPPED). _____

_____ 4. Adjust pot 7 board 7 to DVM reading of 4.63± .002 VDC (FRONT ROLL at 1800 rpm). _____

_____ 5. Recheck pot 6 board 7 reading at 0.000± .002 VDC (ROLLS STOPPED). _____

DYNAMOMETER/RLPC CALIBRATION CHECK LIST

D. DIGITAL SPEED READ-OUT CALIBRATION:

_____ 1. Positive lead of DVM to test point 2 board 8. _____

_____ 2. Switch 2 board 8 to: CAL (Away from board). _____

_____ 3. Adjust pot 5 board 8 to DVM reading of 5.000 ± .002 VDC. _____

_____ 4. Adjust span pot under logic on instrument box to: 50.0 mph ON DIGITAL SPEEDMETER. _____

E. TORQUE CELL CALIBRATION:

_____ 1. Remove vehicle - RELEASE DYNO BRAKES. _____

_____ 2. Switches 1 and 2 board 8 and switch 1 board 7 to: RUN (TOWARD BOARD). _____

_____ 3. Positive lead of DVM to test point 4 board 8 reading (INCLUDING + or - SIGN). _____

_____ 4. Switch 2 board 8 to: CAL (AWAY FROM BOARD). _____

_____ 5. Adjust pot 5 board 8 to: 50 mph READING ON DIGITAL SPEEDMETER. _____

_____ 6. Positive lead of DVM to test point 1 board 8. _____

_____ 7. Remove load cell hysteresis (LIGHTLY TAP LOAD CELL MOUNTING CHANNEL WITH MALLET). _____

_____ 8. Adjust pot 1 board 8 to DVM reading of 0.05± 0.005 VDC. _____

_____ 9. Positive lead of DVM to test point 4 board 8. _____

_____ 10. Adjust pot 1 board 8 clockwise until DVM reading JUST equals reading at 3_____ (TURN POT SLOWLY SO AS NOT TO OVERSHOOT READING). _____

_____ 11. Positive lead of DVM to test point 1 board 8 (RECORD READING). _____

_____ 12. Install arbor D33102 and TIGHTEN - retaining screw to snug. _____

_____ 13. Gently install three D33112 Weights - REMOVE HYSTERESIS. _____

EG&G AUTOMOTIVE RESEARCH

DYNAMOMETER/RLPC CALIBRATION CHECK LIST

E. TORQUE CELL CALIBRATION: (continued)

_____ 14. Adjust pot 2 board 8 to DVM reading of 4.07± .002 VDC. _____

_____ 15. Remove weight and arbor - REMOVE HYSTERESIS. _____

_____ 16. Compare DVM reading with reading in 11 within ± 0.002 VDC if not within tolerance, adjust pot 1 board 8 to proper setting - - THEN REPEAT STEPS 12 through 16. _____

F. DIGITAL POWER READOUT CALIBRATION:

_____ 1. Adjust power meter reading to: 00.0 HP (ADJUST SCREW LOCATED AT LOWER RIGHT HAND CORNER OF METER DVM). _____

_____ 2. Switches 1 and 2 board 8 to: CAL (AWAY FROM BOARD). _____

_____ 3. Adjust pot 5 board 8 to: 50.0 mph (ON DITITAL SPEEDMETER) _____

_____ 4. Positive lead of DVM to test point 1 board 8. _____

_____ 5. Adjust pot 6 board 8 to DVM reading of 4.070 ± .002 VDC. _____

_____ 6. Adjust power span pot for reading of 40.7 (LOCATED UNDER CLAYTON LOGO). _____

G. HORSEPOWER SCALING VERIFICATION:

_____ 1. Switch 1 board 8 to: RUN (TOWARD BOARD) _____

_____ 2. Adjust pot 5 board 8 to: 50.0 mph (ON DIGITAL SPEEDMETER) _____

_____ 3. Install arbor and weights and verify reading (REMOVE HYSTERESIS AFTER EACH WEIGHT). _____

_____ None 00.0 ± 0.1 Arbor + 35# 14.8 + 0.1 _____

_____ Arbor 1.9 ± 0.1 Arbor + 110# 40.7 ± 0.1 _____

_____ Arbor + 70# 27.8 ± 0.1

_____ 4. If not within tolerance, STEPS "E" AND "F" REPEATED TO CORRECT. _____

DYNAMOMETER/RLPC CALIBRATION CHECK LIST

H. HORSEPOWER "CAL CHECK" CALIBRATION:

_____ 1. Warm up dynamometer for minimum 15 minutes. _____

_____ 2. Set mode selector switch to: PENDENT _____

_____ 3. Switch 1 board 8 to: RUN (TOWARD BOARD). _____

_____ 4. Switch 1 board 7 to: RUN (TOWARD BOARD). _____

_____ 5. Switch 2 board 8 to: CAL (AWAY FROM BOARD). _____

_____ 6. Adjust pot 5 board 8 to: 50.0 mph (ON DIGITAL SPEEDMETER) _____

_____ 7. Remove vehicle - RELEASE DYNO BRAKES. _____

_____ 8. Remove load cell HYSTERESIS. _____

_____ 9. Press CAL check button and record HP reading _____ HP on digital HP meter. _____

I. DEADBAND ADJUSTMENT:

_____ 1. Turn water supply to dynamometer OFF. _____

_____ 2. Press pendant load or unload button to RELEASE pressure in the lines. _____

_____ 3. Speed/power switch to: FRONT ROLL _____

_____ 4. Set thumbwheel to: 30.0 mph _____

_____ 5. Set mode selector to: THUMBWHEEL _____

_____ 6. Set vehicle factor to: 0.00 _____

_____ 7. Switches 1 and 2 board 8 and switch 1 board 7 to: CAL (AWAY FROM BOARD). _____

_____ 8. Adjust pot 5 board 8 to: 50.0 mph (ON DIGITAL SPEEDMETER) _____

_____ 9. Adjust pot 6 board 8 to: 30.0 mph (ON DIGITAL SPEEDMETER) _____

_____ 10. Adjust pot 6 board 8 to START LOW RATE UNLOAD LIGHT PULSE - RECORD HP READING _____ HP. _____

DYNAMOMETER/RLPC CALIBRATION CHECK LIST

I. DEADBAND ADJUSTMENT: (continued)

_____ 11. Adjust pot 6 board 8 to START LOW RATE UNLOAD LIGHT PULSE - RECORD HP READING_____HP. _____

_____ 12. Difference between 11 and 12_____HP (THIS IS THE DEADBAND). _____

_____ 13. Adjust pot 3 board 2 and REPEAT 8 and 9 UNTIL DEADBAND IS 0.4 HP. _____

J. THUMBWHEEL "LOW RANGE" ADJUSTMENT:

_____ 1. Set thumbwheel to: 3.0 HP _____

_____ 2. Set mode selector to: THUMBWHEEL _____

_____ 3. Set vehicle factor switch to: 0.00 _____

_____ 4. Switches 1 and 2 board 8 and switch 1 board 7 to: CAL (AWAY FROM BOARD). _____

_____ 5. Adjust pot 5 board 8 to: 50.0 mph (ON DIGITAL SPEEDMETER) _____

_____ 6. Adjust pot 6 board 8 to: 3.0 HP (ON DIGITAL POWER METER) _____

_____ 7. Adjust pot 1 board 7 until LOW AND HIGH RATE LOAD AND UNLOAD LIGHTS GO OUT. _____

_____ 8. Adjust pot 6 board 8 counter - CLOCKWISE TO START LOW RATE UNLOAD LIGHT PULSE - RECORD HP READING:_____HP. _____

_____ 9. Adjust pot 6 board 8 CLOCKWISE TO START LOW RATE LOAD LIGHT PULSE - RECORD HP READING:_____HP. _____

_____ 10. Adjust pot 1 board 7 for LOAD LIGHT PULSE AND UNLOAD LIGHT PULSE - TO BE CENTERED AROUND 3.0. _____

K. THUMBWHEEL "SPAN" ADJUSTMENT:

_____ 1. Set thumbwheel to: 39.0 HP _____

_____ 2. Set mode selector to: THUMBWHEEL _____

_____ 3. Set vehicle factor to: 0.00 _____

_____ 4. Switches 1 and 2 board 8 and 1 board 7 to: CAL (AWAY FROM BOARD).

_____ 5. Adjust pot 5 board 8 to: 50.0 ON DIGITAL SPEEDMETER. _____

DYNAMOMETER/RLPC CALIBRATION CHECK LIST

K. THUMBWHEEL "SPAN" ADJUSTMENT: (continued)

_____ 6. Adjust pot 6 board 8 to: 39.0 HP ON DIGITAL POWER METER. _____

_____ 7. Adjust pot 1 board 1 until LOW AND HIGH RATE LOAD/UNLOAD LIGHTS GO OUT. _____

_____ 8. Adjust pot 6 board 8 counter-CLOCKWISE TO START LOW RATE UNLOAD LIGHT PULSE. RECORD HP READING:_____HP _____

_____ 9. Adjust pot 6 board 8 CLOCKWISE TO START LOW RATE LOAD LIGHT PULSE. RECORD HP READING:_____HP _____

_____ 10. Adjust pot 1 board 1 for LOAD LIGHT PULSE AND UNLOAD LIGHT PULSE. TO BE CENTERED AROUND 39.0 HP. (DIFFERENCE BETWEEN 8 and 9). _____

L. HIGH RATE DEADBAND ADJUSTMENT:

_____ 1. Set thumbwheel to: 39.0 HP. _____

_____ 2. Set mode selector to: THUMBWHEEL _____

_____ 3. Set vehicle factor to: 0.00 _____

_____ 4. Switches 1 and 2 board 8 and switch 1 board 7 to: CAL (AWAY FROM BOARD). _____

_____ 5. Adjust pot 5 board 8 to: 50.0 mph ON DIGITAL SPEEDMETER. _____

_____ 6. Adjust pot 6 board 8 to: 40.5 mph ON DIGITAL POWER METER. _____

_____ 7. Adjust pot 1 board 3 to START HIGH RATE UNLOAD LIGHT _____

_____ 8. Adjust pot 6 board 8 to: 37.5 HP ON DIGITAL POWER METER. _____

_____ 9. Adjust pot 1 board 2 to START HIGH RATE LOAD LIGHT. _____

M. DRIVER CUT-OFF ADJUSTMENT:

_____ 1. Set thumbwheel to: 00.0 HP _____

_____ 2. Switches 1 and 2 board 8 and switch 1 board 7 to: RUN (TOWARD THE BOARD) _____

_____ 3. Positive lead of DVM to TEST POINT 1 board 8. _____

_____ 4. Adjust pot 1 board 8 to DVM READING OF +0.060 ± .005 VDC. _____

DYNAMOMETER/RLPC CALIBRATION CHECK LIST

M. DRIVER CUT-OUT ADJUSTMENT: (continued)

_____ 5. Adjust pot 2 board 3 CLOCKWISE UNTIL BOTH LOW AND HIGH RATE UNLOAD LIGHT GO OUT. _____

_____ 6. REMOVE HYSTERESIS. _____

_____ 7. Adjust pot 1 board 8 to SAME READING AS RECORDED IN E-11 - READING (INCLUDE + OR - SIGN). _____

N. FINAL SYSTEM PREPARATION:

_____ 1. Switches 1 and 2 board 8 and switch 1 board 7 to: RUN (TOWARD THE BOARD). _____

_____ 2. Remove DVM leads. _____

_____ 3. Reinstall COVER ON CONTROL BOX. _____

_____ 4. Return LOGO ON INSTRUMENT BOX TO HORIZONTAL. _____

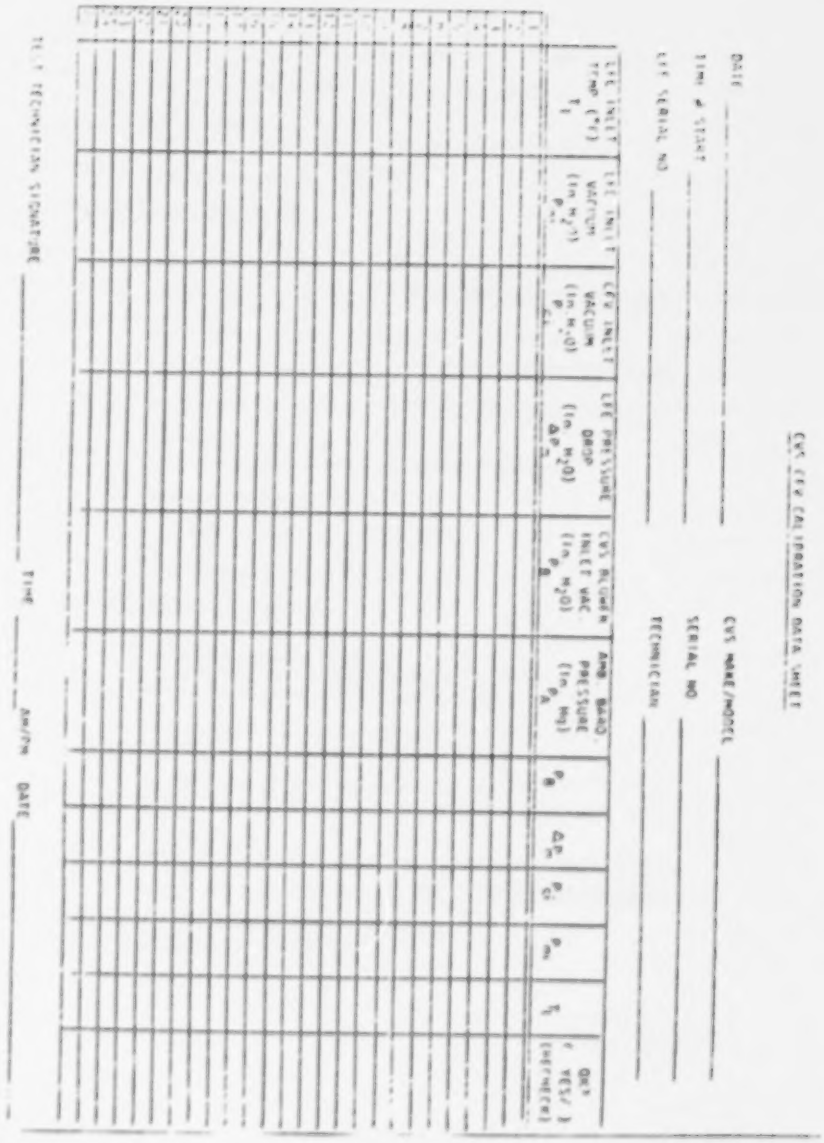
_____ 5. Turn WATER SUPPLY ON. (RECORD WATER PRESSURE). _____

SIGNATURE OF TECHNICIAN: _____

DATE: _____ TIME: _____AM _____PM

THESE DATA SHEETS HAVE BEEN REVIEWED AND APPROVED BY EG&G-AR QUALITY CONTROL DEPARTMENT.

_____ DATE: _____



APPENDIX E

Audit Forms

1) Comments to be resolved
2) Quality Control Audit of: Non-Evaporative Hot LA-4 Precondition Check List
3) Quality Control Audit of: Precondition Trace
4) Quality Control Audit of: Dynamometer Warm-up Check List
5) Quality Control Audit of: Driver's FTP Check List
6) Quality Control Audit of: WB/DB Chart (EPA sequence)
7) Quality Control Audit of: FTP Driver's Trace
8) Quality Control Audit of: CO/CO_2 Instrument Traces
9) Quality Control Audit of: CO/CO_2 Instrument Traces (Bagged Idle Test)
10) Quality Control Audit of: HC/NOx Instrument Traces
11) Quality Control Audit of: NO Instrument Traces (50 Cruise Test)
12) Quality Control Audit of: HC/NOx Instrument Traces (Bagged Idle Test)
13) Quality Control Audit of: HC/NOx Instrument Traces (Highway Fuel Economy)
14) Quality Control Audit of: CO/CO_2 Instrument Traces (Highway Fuel Economy)
15) Quality Control Audit of: NO Instrument Trace - Loaded Two Mode
16) Quality Control Audit of: NO Instrument Trace (4 Speed Idle Test)
17) Quality Control Audit of: CO/CO_2 Instrument Traces (4 Speed Idle Test)
18) Quality Control Audit of: CO/CO_2 Instrument Traces (50 Cruise Test)
19) Quality Control Audit of: Hexane Instrument Trace (50 Cruise Test)
20) Quality Control Audit of: Hexane Instrument Trace (4 Speed Idle Test)
21) Quality Control Audit of: CO/CO_2 Instrument Traces - Loaded Two Mode
22) Quality Control Audit of: Hexane Instrument Trace - Loaded Two Mode
23) Quality Control Audit of: CVS-CFV Test Data Sheet

APPENDIX E

Audit Forms
(continued)

24) Quality Control Audit of: Bagged Idle Test

25) Quality Control Audit of: 50 Cruise Test Data Sheet

26) Quality Control Audit of: Highway Fuel Economy Data Sheet

27) Quality Control Audit of: 4 Speed Idle Test (Data Sheet)

28) Quality Control Audit of: Loaded Two Mode (Data Sheet)

29) Quality Control Audit of: Computer Input and Output

30) Data Packet Enclosure Test

COMMENTS TO BE RESOLVED

	Comments	Comments Resolved	QC Review	OK
S. Gearhart				
B. Martines				
C. Jackel				
B. GILMORE				
L.HERNANDEZ				
R. Martines				
C. Vantassel				
R. Bellows				
R. Schoeberger				

QUALITY CONTROL AUDIT OF:

NON-EVAPORATIVE HOT LA-4 PRECONDITION CHECK LIST

	Yes	No	Contact	Comments	Comments Resolved
1) Test Number					
2) Vehicle Number					
3) Date					
4) Dyno Code					
5) Time					
6) I.W. Correct?					
7) I.H.P. Correct?					
8) Correct Fuel Type Used?					
9) Correct Fuel Tank Capacity Entered?					
10) Correct Amount of Fuel Put In Tank?					
11) Fuel Temp Less Than 86°F					
12) Are Items 1 - 8 Completed Properly?					
13) Correct Time Entered for Last Dyno Use?					
14) Are Items 9 - 16 Completed Properly?					
15) Is Test Area Temp Between 68°F and 86°F?					
16) Are Items 17 - 20 Completed Properly?					
17) Is IHP From Digital Display within ± .2 of the Value Determined During Calibration?					
18) Time at End of Precondition (S.O.S.)					
19) Items 21 - 28 Completed Properly?					
20) Is Soak Area Temp Between 68°F and 86°F?					
21) Driver's Signature Entered?					
22) QC Signature Entered?					

QUALITY CONTROL AUDIT OF:

PRECONDITION TRACE

	Yes	No	Contact	Comments	Comments Resolved
1) Vehicle Number					
2) Test Number					
3) Dyno Number					
4) Date					
5) Time					
6) Time Less than 2 Minute After Dyno Warm Up?					
7) I.W. Correct?					
8) I.H.P. Correct?					
9) 50 MPH Entered Adjacent to I.H.P.					
10) 50 MPH Cal. Check on Trace?					
11) Driver's Signature on Trace?					
12) Trace OK?					
13) Q.C. Signature Entered?					

QUALITY CONTROL AUDIT OF:

DYNAMOMETER WARM-UP CHECK LIST

Part "A"	Yes	No	Contact	Comments	Comments Resolved
1) Date					
2) Dyno Code					
3) Test Number					
4) Car Number					
5) Start Time					
6) Vehicle Make Entered?					
7) Vehicle Model Entered?					
8) I.H.P. Correct?					
9) I.W. Correct?					
10) Tech. Name Entered?					
11) Items 1-14 Properly Completed?					
Part "B"					
12) Item 1 Completed?					
13) Is Applied Inertia Weight correct?					
14) Items 3-6 Completed Properly?					
15) Stop Time from Item 6					
16) Items 7-11 Completed Properly?					
17) Driver's Signature Entered?					
18) Date Entered?					
19) Time Entered?					
20) QC Signature Entered?					

DATA FORM 9: _____

QUALITY CONTROL AUDIT OF:
DRIVER'S FTP CHECK LIST

	Yes	No	Contact	Comments	Comments Resolved
1) Date					
2) Test Number					
3) Vehicle Number					
4) Dyno Number					
5) Driver's Name Entered?					
6) I.W. Correct?					
7) I.H.P. Correct?					
8) Time at Beginning of 12 Hour Soak (SOS)					
9) Is Above Time Same as End of Precondition?					
10) Time at Start of Test?					
11) Is SOT 12-24 Hours Later Than SOS?					
12) Is Calculated Soak Time Correct?					
13) Time at Which Dyno Was Last Used?					
14) Are Items 1-7 Properly Completed?					
15) Were Vehicle Tires at Approx. 45 PSI for Test?					
16) Are Items 8-16 Properly Completed?					
17) Do Sling and Strip Chart Agree Within 1.0°F?					
18) Are Items 17-26 Properly Completed?					
19) Starting Conditions Properly Noted?					
20) Are Items 27-41 Properly Completed?					
21) Driver's Signature Entered?					
22) Q.C. Signature Entered?					

QUALITY CONTROL AUDIT OF:
WB.DB CHART (EPA Sequence)

	Yes	No	Contact	Comments	Comments Resolved
1) Vehicle Number					
2) Test Number					
3) Date					
4) Time Entered?					
5) Driver's Name or Initial's Entered?					
6) SOP 1 Marked?					
7) SOP 2 Marked?					
8) Hot Soak Marked?					
9) SOP 3 Marked?					
10) EOT Marked?					
11) DB Temp. 68°F to 86°F?					
3 MIN. BAGGED IDLE					
12) SOT Marked?					
13) EOT Marked?					
14) DB Temp 68°F to 86°F?					
50 CRUISE TEST					
15) SOT Marked?					
16) EOT Marked?					
17) DB Temp. 68°F to 86°F?					
HOT					
18) SOT Marked?					
19) EOT Marked?					
20) DB Temp 68°F to 86°F?					
4 SPEED IDLE					
21) SOT Marked?					
22) SOT Marked?					
23) DB Temp 68°F to 86°F?					
LOADED 2 MODE					
24) SOT Marked?					
25) EOT Marked?					
26) DB Temp. 68°F to 86°F?					
Q.C. SIGNATURE ENTERED?					

QUALITY CONTROL AUDIT OF:

FTP DRIVER'S TRACE

	Yes	No	Contact	Comments	Comments Resolved
1) Vehicle Number					
2) Test Number					
3) Dyno Number					
4) Date					
5) Time					
6) Driver's Signature on Trace					
7) I.W. Correct?					
8) I.H.P. Correct?					
9) 50 MPH Entered Adjacent to I.H.P.?					
10) 50 MPH Calibration at Beginning of Trace?					
11) Trace OK?					
12) Driving Abnormalities Noted?					
13) 50 MPH Speed Check at End of Trace?					
14) Is I.H.P. Within ± 0.5 HP of Original Setting?					
15) QC Signature Entered?					

QUALITY CONTROL AUDIT OF:

CO/CO_2 INSTRUMENT TRACES

	Phase 1 Yes	Phase 1 No	Phase 2 Yes	Phase 2 No	Phase 3 Yes	Phase 3 No	Contact	Comments	Comments Resolved
1) Vehicle Number									
2) Test Number									
3) Date									
4) Time Entered?									
5) Signature Entered?									
6) Chart Speed Entered?									
7) CO Span OK? (Low Range)									
8) CO_2 Span OK? (Low Range)									
9) Zero OK?									
10) CO Span OK?									
11) CO_2 Span OK?									
12) Zero OK?									
13) CO Sample OK?									
14) CO Range?									
15) CO Deflection?									
16) CO_2 Sample OK?									
17) CO_2 Range?									
18) CO_2 Deflection?									
19) Ambient CO Trace OK?									
20) Ambient CO Deflection?									
21) Ambient CO OK?									
22) Ambient CO_2 Trace OK?									
23) Ambient CO_2 Deflection?									
24) Zero OK?									
25) CO Span OK?									
26) CO_2 Span OK?									
27) Zero OK?									
28) Repeat Steps 9 - 27									
29) All Operator Errors Marked?									
30) QC Signature Entered?									

DATA FORM NO. _____

QUALITY CONTROL AUDIT OF:
CO/CO_2 INSTRUMENT TRACES:
(Bagged Idle Test)

	Yes	No	Contact	Comments	Comments Resolved
1) Zero OK?					
2) CO Span OK?					
3) CO_2 Span OK?					
4) Zero OK?					
5) CO Sample OK?					
6) CO Range ?					
7) CO Deflection?					
8) CO_2 Sample OK?					
9) CO_2 Range?					
10) CO_2 Deflection?					
11) Ambient CO OK?					
12) Ambient CO Deflection?					
13) Ambient CO_2 OK?					
14) Ambient CO_2 Deflection					
15) Zero OK?					
16) CO Span OK?					
17) CO_2 Span OK?					
18) Zero OK?					
19) ALL OPERATOR ERRORS MARKED?					
20) If C. SIGNATURE ENTERED?					

QUALITY CONTROL AUDIT OF:
HC/NO_x INSTRUMENT TRACES

	Phase 1 Yes	Phase 1 No	Phase 2 Yes	Phase 2 No	Phase 3 Yes	Phase 3 No	Contacts	Comments	Comments Resolved
1) Vehicle Number									
2) Test Number									
3) Date									
4) Time Entered?									
5) Signature Entered?									
6) Chart Speed Entered?									
7) HC Span OK (Low Range)?									
8) NO_x Span OK (Low Range)?									
9) Zero OK?									
10) HC Span OK?									
11) NO_x Span OK?									
12) Zero OK?									
13) HC Sample OK?									
14) HC Range									
15) HC Deflection									
16) NO_x Sample OK?									
17) NO_x Range									
18) NO_x Deflection									
19) Ambient HC Trace OK?									
20) Ambient HC Deflection									
21) Ambient HC OK?									
22) Ambient NO_x Trace OK?									
23) Ambient NO_x Deflection									
24) Zero OK?									
25) HC Span OK?									
26) NO_x Span OK?									
27) Zero OK?									
28) Repeat Steps 9-27									
29) All Operator Errors Marked?									
30) QC Signature Entered?									

DATA FORM NO._____

QUALITY CONTROL AUDIT OF:
NO INSTRUMENT TRACES:
(50 Cruise Test)

	30 Second Sample		Contact	Comments	Comments Resolved
1) Zero?					
2) NO Span OK?					
3) Zero OK?					
4) NO Sample OK?					
5) NO Range					
6) NO Deflection					
7) Zero OK?					
8) NO Span OK?					
9) Zero OK?					
10) All Operator Errors Marked?					
11) Q.C. Signature Entered?					

DATA FORM NO._____

QUALITY CONTROL AUDIT OF
HC/NO_x INSTRUMENT TRACES
(Banged Idle Test)

	Yes	No	Contact	Comments	Comments Resolved
1) Zero?					
2) HC Span OK?					
3) NO_x Span OK?					
4) Zero OK?					
5) HC Sample OK?					
6) HC Range?					
7) HC Deflection?					
8) NO_x Sample OK?					
9) NO_x Range?					
10) NO_x Deflection?					
11) Ambient HC OK?					
12) Ambient HC Deflection?					
13) Ambient NO_x OK?					
14) Ambient NO_x Defletion?					
15) Zero OK?					
16) HC Span OK?					
17) NO_x Span OK?					
18) Zero OK?					
19) All Operator Errors Marked?					
20) Q.C. Signature Entered?					

DATA FORM NO._____

QUALITY CONTROL AUDIT OF:
HC/NO_x INSTRUMENT TRACES:
(Highway Fuel Economy)

	Yes	No	Contact	Comments	Comments Resolved
1) Zero?					
2) HC Span OK?					
3) NO_x Span OK?					
4) Zero OK?					
5) HC Sample OK?					
6) HC Range?					
7) HC Deflection?					
8) NO_x Sample OK?					
9) NO_x Range?					
10) NO_x Deflection?					
11) Ambient HC OK?					
12) Ambient HC Deflection?					
13) Ambient NO_x OK?					
14) Ambient NO_x Defletion?					
15) Zero OK?					
16) HC Span OK?					
17) NO_x Span OK?					
18) Zero OK?					
19) All Operator Errors Marked?					
20) Q.C. Signature Entered?					

DATA FORM NO._____

QUALITY CONTROL AUDIT OF:
CO/CO_2 INSTRUMENT TRACES:
(Highway Fuel Economy)

	Yes	No	Contact	Comments	Comments Resolved
1) Zero OK?					
2) CO Span OK?					
3) CO_2 Span OK?					
4) Zero OK?					
5) CO Sample OK?					
6) CO Range ?					
7) CO Deflection?					
8) CO_2 Sample OK?					
9) CO_2 Range?					
10) CO_2 Deflection?					
11) Ambient CO OK?					
12) Ambient CO Deflection?					
13) Ambient CO_2 OK?					
14) Ambient CO_2 Deflection?					
15) Zero OK?					
16) CO Span OK?					
17) CO_2 Span OK?					
18) Zero OK?					
19) ALL OPERATOR ERRORS MARKED?					
20) Q.C. SIGNATURE ENTERED?					

DATA FORM NO. _____

QUALITY CONTROL AUDIT OF:
NO INSTRUMENT TRACE:
LOADED TWO MODE

	30 mph 19.0 APH		Basic Idle Trans. In Neut		Contact	Comments	Comments Resolved
1) Zero OK?							
2) NO Span OK?							
3) Zero OK?							
4) NO Sample OK?							
5) No Range							
6) NO Deflection							
7) Zero OK?							
8) NO Span OK?							
9) Zero OK?							
10) Repeat Steps							
11) All Operator Errors Marked?							
12) Q.C. Signature Entered?							

DATA FORM NO. _____

QUALITY CONTROL AUDIT OF
NO INSTRUMENT TRACE
(4 Speed Idle Test)

	Basic Idle In Neutral		Idle At 2500 rpm		Basic Idle In Neutral		Basic Idle In Drive		Contacts/ Comments	Comments Resolved
	Yes	No	Yes	No	Yes	No	Yes	No		
1) Zero?										
2) NO Span OK?										
3) Zero OK?										
4) NO Sample OK?										
5) NO Range										
6) NO Deflection										
7) Zero OK?										
8) NO Span OK?										
9) Zero OK?										
10) Repeat Steps										
11) All Operator Errors Marked?										
12) Q.C. Signature Entered?										

* Does not apply with manual transmission

DATA FORM NO._____

QUALITY CONTROL AUDIT OF:
CO/CO_2 INSTRUMENT TRACES:
(4 Speed Idle Test)

	Basic Idle In Neutral Yes	Basic Idle In Neutral No	Idle At 2500 rpm Yes	Idle At 2500 rpm No	Basic Idle In Neutral Yes	Basic Idle In Neutral No	Basic Idle In Drive Yes	Basic Idle In Drive No	Contacts/ Comments	Comments Resolved
1) Zero?										
2) CO Span OK?										
3) CO_2 Span OK?										
4) Zero OK?										
5) CO Sample OK?										
6) CO Range?										
7) CO Deflection?										
8) CO_2 Sample OK?										
9) CO_2 Range?										
10) CO_2 Deflection?										
11) Zero OK?										
12) CO Span OK?										
13) CO_2 Span OK?										
14) Zero OK?										
15) Repeat Steps 6 - 10										
16) All Operator Errors Marked?										
17) Q.C. Signature Entered?										

* Does not apply with manual transmission.

DATA FORM NO._____

QUALITY CONTROL AUDIT OF:
CO/CO_2 INSTRUMENT TRACES:
(50 Cruise Test)

	30 Second Sample		Contact	Comments	Comments Resolved
1) Zero?					
2) CO Span OK?					
3) CO_2 Span OK?					
4) Zero OK?					
5) CO Sample OK?					
6) CO Range					
7) CO Deflection					
8) CO_2 Sample OK?					
9) CO_2 Range					
10) CO_2 Deflection					
11) Zero OK?					
12) CO Span OK?					
13) CO_2 Span OK?					
14) Zero OK?					
15) All Operator Errors Marked?					
16) Q.C. Signature Entered?					

Date Form No. _____

QUALITY CONTROL AUDIT OF:
HEXANE INSTRUMENT TRACE:
(50 Cruise Test)

	30 Second Sample		Contact	Comments	Comments Resolved
1) Zero OK?					
2) Hexane Span OK?					
3) Zero OK?					
4) Hexane Sample OK?					
5) Hexane Range (ppm)					
6) Hexane Deflection					
7) Zero OK?					
8) Hexane Span OK?					
9) Zero OK?					
10) All Operator Errors Marked?					
11) Q.C. Signature Entered?					

QUALITY CONTROL AUDIT OF:
HEXANE INSTRUMENT TRACE:
(4 Speed Idle Test)

	Basic Idle In Neutral		Idle At 2500 rpm		Basic Idle In Neutral		Basic Idle In Drive		Contacts/ Comments	Comments Resolved
	Yes	No	Yes	No	Yes	No	Yes	No		
1) Zero?										
2) Hexane Span OK?										
3) Zero OK?										
4) Hexane Sample OK?										
5) Hexane Range (ppm)										
6) Hexane Deflection										
7) Zero OK?										
8) Hexane Span OK?										
9) Zero OK?										
10) Repeat Steps										
11) All Operator Errors Marked?										
12) Q.C. Signature Entered?										

* Does not apply with manual transmission

DATA FORM #: _____

QUALITY CONTROL AUDIT OF
CO/CO_2 INSTRUMENT TRACES
LOADED TWO MODE

	30 mph 19.0 AHP		Basic Idle Trans. In Neut		Contact	Comments	Comments Resolved
1) Zero OK?							
2) CO Span OK?							
3) CO_2 Span OK?							
4) Zero OK?							
5) CO Sample OK?							
6) CO Range							
7) CO Deflection							
8) CO_2 Sample OK?							
9) CO_2 Range							
10) CO_2 Deflection							
11) Zero OK?							
12) CO Span OK?							
13) CO_2 Span OK?							
14) Zero OK?							
15) Repeat Steps 1-14							
16) All Operator errors marked?							
17) Q.C. Signature entered?							

DATA FORM NO._____

QUALITY CONTROL AUDIT OF:
HEXANE INSTRUMENT TRACE:
LOADED TWO MODE

	30 mph 19.0 APH		Basic Idle Trans. In Neut		Contact	Comments	Comments Resolved
1) Zero OK?							
2) Hexane Span OK?							
3) Zero OK?							
4) Hexane Sample OK?							
5) Hexane Range (PPm)							
6) Hexane Deflection							
7) Zero OK?							
8) Hexane Span OK?							
9) Zero OK?							
10) Repeat Steps							
11) All Operator Errors Marked?							
12) Q.C. Signature Entered?							

QUALITY CONTROL AUDIT OF:
CVS-CFV TEST DATA SHEET

	Yes	No	Contact	Comments	Comments Resolved
1) Date					
2) Test Number					
3) Vehicle Number					
4) Odometer					
5) I.W. Correct?					
6) Thumb Wheel Correct?					
7) Barometric Pressure Reasonable (28.5 to 30 in. Hg.)					
8) Barometric Temp. Reasonable?					
9) Dry Bulb Temp. Correct?					
10) Wet Bulb Temp. Correct?					
11) Roll Revs. Entered Correctly?					
12)					
13) VMIX 1 Reasonable?					
14) VMIX 2 Reasonable?					
15) VMIX 3 Reasonable?					
16) Time at SOP 1?					
17) Is SOP 1 Within Two Hours of Warm Up?					
18) Time at EOP 1?					
19) EOP 1 = SOP 2?					
20) SOP 2 - SOP 1 = +8.5 ± 0.5 Minutes?					
21) EOP 2 - SOP 2 = +14.5 ± 0.5 Minutes?					
22) SOP 3 - EOP 2 = 10 ± 1 Min.?					
23) EOP 3 - SOP 3 = +8.5 ± 0.5 Minutes?					
24) ET 1 = 505 ± 4 sec. + Stall Seconds?					
25) ET 2 = 867 ± 4 Seconds?					
26) ET 3 = 505 ± 4 Seconds + Stall?					

QUALITY CONTROL AUDIT OF:

CVS-CFV TEST DATA SHEET (CONTINUED)

	Yes	No	Contact	Comments	Comments Resolved
27) Ranges Correct for CO?					
28) Ranges Correct for CO_2?					
29) Deflections for CO Read Correctly?					
30) Deflections for CO_2 Read Correctly?					
31) Concentrations Correct for CO?					
32) Concentrations Correct for CO_2?					
33) Ranges Correct for HC?					
34) Ranges Correct for HO_x?					
35) Deflections for HC Read Correctly?					
36) Deflections for HO_x Read Correctly?					
37) Concentrations Correct for HC?					
38) Concentrations Correct for HO_x?					
39) EOA Less Than or Equal To EOP 1 + 20 Minutes?					
40) EOA 2 Less Than or Equal to EOP 2 + 20 Minutes?					
41) EOA 3 Less Than or Equal to EOP 3 + 20 Minutes?					
42) Does Comment Imply Test Is OK?					
43) Operator's Signature Entered?					
44) QC Signature Entered?					

DATA FORM NO. _____

QUALITY CONTROL AUDIT OF:

BAGGED IDLE TEST

	Yes	No	Contact	Comments	Comments Resolved
1) Transmission in proper gear?					
2) Time at START OF TEST?					
3) Time at END OF TEST?					
4) Elapsed Time?					
5) Is Total Test Time 3 min. ± (30 sec.)					
6) Barometric Press. reasonable? (28.5 to 30 in.hg.)					
7) Barometric Temp. reasonable?					
8) (VIMX) reasonable?					
9) Dry bulb correct?					
10) Wet bulb correct?					
11) Ranges correct for CO?					
12) Ranges correct for CO_2?					
13) Deflections for CO read correctly?					
14) Deflections for CO_2 read correctly?					
15) Concentrations correct for CO?					
16) Concentrations correct for CO_2?					
17) Ranges correct for HC?					
18) Ranges correct for HO_x?					
19) Deflections for HC read correctly?					
20) Deflections for HO_x read correctly?					
21) Concentrations correct for HC?					
22) Concentrations correct for HO_x?					
23) EOA Less Than 20 min. From End Of Sample?					
24) Does Comment Imply Test is OK?					
25) Operator's Signature Entered?					
26) Q.C. Signature Entered?					

DATA FORM NO._____

QUALITY CONTROL AUDIT OF:
50 CRUISE TEST DATA SHEET

	Yes	No	Contact	Comments	Comments Resolved
1) Test Start Time:					
2) Test End Time:					
3) End of Sample Equal 30 Seconds:					
4) Barometric Press. reasonable 28.5 to 30 In.Hg.?					
5) Barometric Temp. reasonable?					
6) Dry Bulb Temp. correct?					
7) Wet Bulb Temp. correct?					
8) Ranges correct for CO?					
9) Ranges correct for CO_2?					
10) Deflections for CO read correctly?					
11) Deflections for CO_2 read correctly?					
12) Concentrations correct for CO?					
13) Concentrations correct for CO_2?					
14) Ranges correct for HC?					
15) Ranges correct for NO ?					
16) Deflections for HC read correctly?					
17) Deflections for NO read correctly?					
18) Concentrations correct for HC?					
19) Concentrations correct for NO ?					
20) Does comment imply test is OK?					
21) Operator's Signature Entered?					
22) Is R.P.M. reasonable?					
23) Q.C. Signature Entered?					

DATA FORM NO._____

QUALITY CONTROL AUDIT OF:
HIGHWAY FUEL ECONOMY DATA SHEET

	Yes	No	Contact	Comments	Comments Resolved
1) TEST START TIME:					
2) TEST END TIME:					
3) Is ELAPSED TIME 12.45 min. (± .5 min.)?					
4) Barometric Press. reasonable (28.5 to 30 in.hg.)?					
5) Barometric Temp.reasonable?					
6) Dry bulb Temp. correct?					
7) Wet bulb Temp. correct?					
8) VMIX reasonable?					
9) Roll Revs. correct?					
10) Ranges correct for CO?					
11) Ranges correct for CO_2?					
12) Deflections for CO read correctly?					
13) Deflections for CO_2 read correctly?					
14) Concentrations correct for CO?					
15) Concentrations correct for CO_2?					
16) Ranges correct for HC?					
17) Ranges correct for NO_x?					
18) Deflections for HC read correctly?					
19) Deflections for NO_x read correctly?					
20) Concentrations correct for HC?					
21) Concentrations correct for NO_x?					
22) EOA less than or equal to 20 min.?					
23) Does comment imply test is OK?					
24) Operator's signature entered?					
25) Q.C. Signature entered?					

DATA FORM NO. _____

QUALITY CONTROL AUDIT OF:
4 SPEED IDLE TEST (Data Sheet)

	Yes	No	Contact	Comments	Comments Resolved
1) TEST START TIME:					
2) TEST END TIME:					
3) ELAPSED TIME:					
4) Barometric Press. reasonable (28.5 to 30 in.hg.)?					
5) Dry bulb Temp› correct?					
6) Wet Bulb Temp. correct?					
7) Ranges correct for CO?					
8) Ranges correct for CO_2?					
9) Deflections for CO read correctly?					
10) Deflections for CO_2 read correctly?					
11) Concentrations correct for CO?					
12) Concentrations correct for CO_2?					
13) Ranges correct for HC?					
14) Ranges correct for NO ?					
15) Deflections for HC read correctly?					
16) Deflections for NO read correctly?					
17) Concentrations correct for HC?					
18) Concentrations correct for NO ?					
19) Is R.P.M. reasonable?					
20) Does comment imply test is OK?					
21) Operator's Signature entered?					
22) Q.C. Signature entered?					

DATA FORM NO. _____

QUALITY CONTROL AUDIT OF:
LOADED TWO MODE (Data Sheet)

	Yes	No	Contact	Comments	Comments Resolved
1) TEST START TIME:					
2) TEST END TIME:					
3) ELAPSED TIME:					
4) Barometric Press. reasonable 28.5 to 30 in.hg.?					
5) Barometric Temp. reasonable?					
6) Dry bulb Temp. correct?					
7) Wet bulb Temp. correct?					
8) Is the I.W. 1000 lbs.?					
9) Is the I.H.P. correct?					
10) Ranges correct for CO?					
11) Ranges correct for CO_2?					
12) Deflections for CO read correctly?					
13) Deflections for CO_2 read correctly?					
14) Concentrations correct for CO?					
15) Concentrations correct for CO_2?					
16) Ranges correct for HC?					
17) Ranges correct for NO_x?					
18) Deflections for HC read correctly?					
19) Deflections for NO_x read correctly?					
20) Concentrations correct for HC?					
21) Concentrations correct for NO_x?					
22) Does comment imply test is OK?					
23) Operator's Signature entered?					
24) Is R.P.M. reasonable?					
25) Q.C. Signature Entered?					

QUALITY CONTROL AUDIT OF:

COMPUTER INPUT AND OUTPUT

	Yes	No	Contact	Comments	Comments Resolved
1) Date					
2) Vehicle Number					
3) Test Number					
4) Roll Revs. Entered Correctly					
5) If 1977 Year Model, Were STD Roll Revs. Used					
6) BD Entered Correctly?					
7) BT Entered Correctly?					
8) DB Temp Correct?					
9) WB Temp Correct?					
10) VMIX Correct?					
11)					
12) Meter Reading Correct?					
13) Concentration Values Correct?					
14) QC Signature Entered?					

DATA PACKET ENCLOSURE LIST
EPA Contract No. 68-03-3024

To be submitted with each Data Packet.

I. Emissions Testing Data

_____ Precondition Check List
_____ Precondition Trace
_____ Test Drivers Check List Pages 1 through 7
_____ FTP Trace
_____ Vehicle Refueling Records
_____ Bench Operator Data Forms Pages 1 through 7
_____ WB/DB Trace
_____ Soak Area Trace
_____ Analytical Traces
_____ CVS Print-Out
_____ Quality Audit Work Sheets
_____ Vehicle Driveability Report
_____ Highway Fuel Economy Print-Out
_____ Bagged Idle Print-Out
_____ Test Validity Statement

II. Procurement Data

_____ Telephone Survey (3024.2)
_____ Incoming Inspection Form (3024.8)
_____ Test Agreement (3024.1)
_____ Test Agreement Addendum (3024.3)
_____ Standard Vehicle Loan Agreement (3024.4)
_____ Savings Bond Information Sheet (3024.6)
_____ Vehicle Owner Questionnaire Data Sheet
_____ Supplemental Owners Survey
_____ Loaner Vehicle Log (3024.7)
_____ Mechanics Inspection Form (3024.9)
_____ Vehicle Maintenance Log (3024.10)
_____ EPA Data Pack
_____ Vehicle Information Sheet (3024.12)
_____ Post Test Inspection Form (3024.11)
_____ Vehicle Release and Savings Bond Receipt (3024.5)
_____ Procurement Check List (3024.13)

III. Supplied To Owner

_____ Fuel Economy Kit
_____ Contractor Information Filled In
_____ Vehicle Fuel Fill In Information Recorded
_____ Letter Of Appreciation
_____ EPA Follow-up Letter and Envelope
_____ Contractor Portion Fill In
_____ Savings Bond
_____ Vehicle Maintenance Log (3024.10)

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